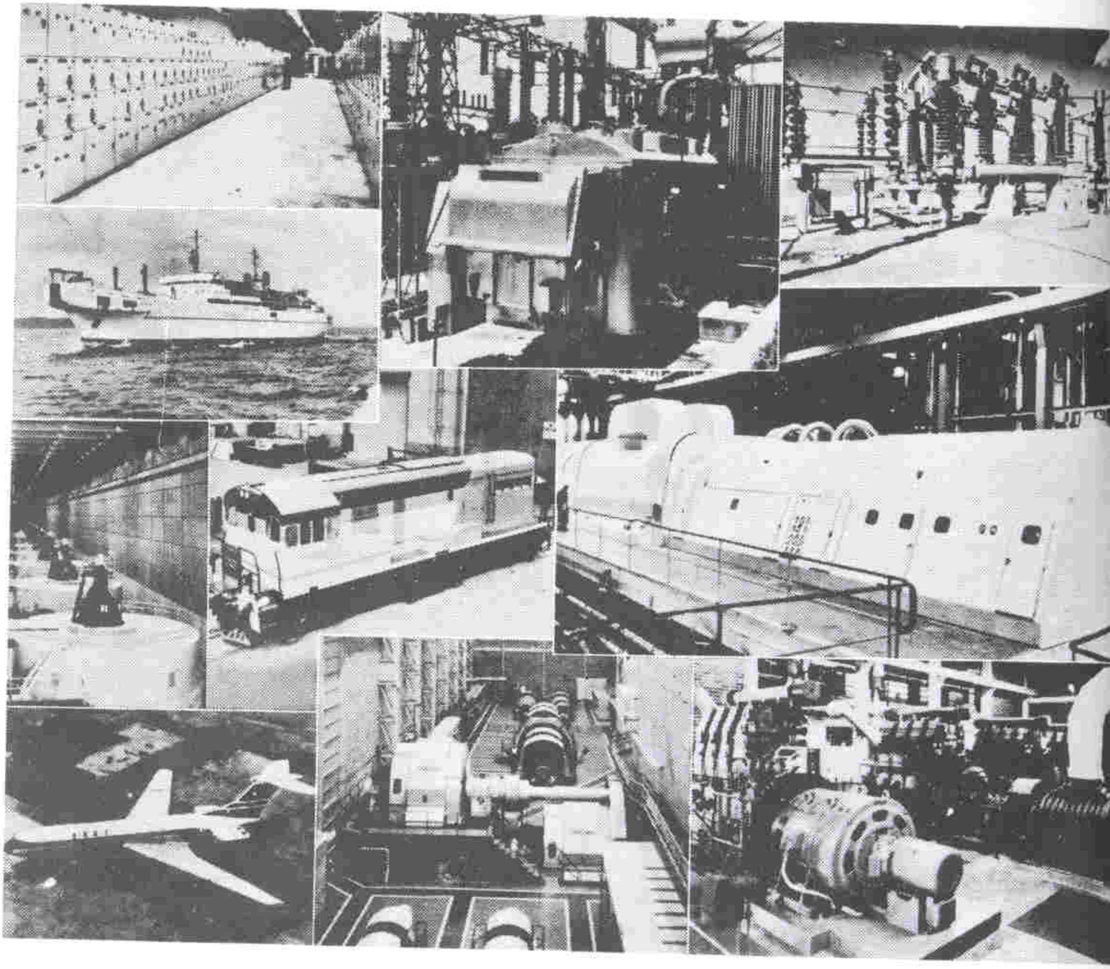
HYSTERESIS

**YEAR BOOK OF
THE ADELAIDE UNIVERSITY
ENGINEERING SOCIETY**

1966



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HYSTERESIS

1966

Editor: R. L. Smith

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Contents

EDITORIAL

Australia is one of the minority of industrialised countries which still uses the British or foot-pound-second system of measurement. All students of Engineering are aware of the more rational metric (metre-kilogram-second) system which is to be preferred for calculation purposes. Many professions already use the metric system - Science, Medicine, Pharmacy and Electrical Engineering.

To most of those who utilise a measurement system, the greatest difficulty arises in visualising these quantities and estimating their magnitude without the aid of a measuring device. This problem has no doubt confronted most Australians since the introduction of decimal currency. As with a change in currency, a change in the system of measurement must be gradual, perhaps extending over ten to twenty years.

The manufacturing industries would be those most affected by such a changeover, due to the enormous amount of machinery which cannot be easily converted. However, in the field of bearings, for instance, the wheels of progress are being set in motion. Most bearings for new designs are specified in metric dimensions and only replacements are made to British specifications. This dual manufacturing also occurs in many industries supplying both English speaking and European countries with engineering hardware.

To all who have studied and/or passed Surveying, the abolition of rods, poles, perches and acres and the many head-aches associated with them would be a welcome event.

> "The greatest opposition would probably come from the layman who derives only slight benefit from any particular system, and cannot therefore command major consideration. Education over two generations would produce a layman thinking in terms of new units".

THE DEAN'S PAGE

Prof. W.F. Tait
Prof. of Chemical Engineering

Over the past two decades, automation has been very much in the forefront of our thoughts. To many people the very word conjures up visions of mass unemployment and the elimination of all but the most highly skilled jobs. Many of you who read this article may have to be responsible at some time for the introduction of one or other form of automation. If you have any social conscience you must be concerned about the possible implications of such action for the future of mankind.

Automatic machinery and a fear thereof is, of course, not new. As long ago as 1835, Edward Baines in his "History of the Cotton Manufacture in Great Britain" pointed out that prior to the introduction of machinery only 40,000 people in Britain earned their living by the manufacture of cotton. Within a few decades of the first use of machines, 1,500,000 people were being supported by the cotton industry and they were producing goods which formerly would have required 300 to 400 million workers. Speaking of members of Parliament who bemoaned the fact that one man with a machine could produce as much cotton yarn as about 250 men with hand-wheels, Baines says:

"These people appear to cherish the absurd opinion that if there were no machines, manufacture would really give employment to as many millions as now; nor do they reflect that the whole of Europe would be inadequate for all this work; and that in that case a fifth of the whole population would need to be occupied with cotton spinning alone."

Of course, it has been said that the introduction of automation differs in kind as well as in degree from the introduction of repetitive machines. The repetitive machine still needs relatively unskilled labour to tend it, whereas the fully automated factory needs virtually no unskilled labour.

As recently as 1949, Norbert Wiener forecast that the wide-spread use of computers and automation would lead to at least a decade of "ruin and despair" in the United States. Even in 1955, many witnesses testified before a United States Congressional Sub-committee that intolerable unemployment was certain unless automation was used wisely and well. Yet the facts are that between 1949 and 1965, the number of employed persons in the United States rose from 49 to 71 millions and at the same time the real increase in earnings per worker was between 35 and 40 per cent.

Although it is difficult to obtain complete statistics, all the evidence suggests that not more than three people in 10,000 have been laid off as the result of automation. Naturally where automation has been installed a large percentage (possibly as much as 70 to 80) of the work force has had to be retrained, but after retraining they have been able to hold down more interesting and better paid jobs. Somewhat less than 10% have proved incapable of undertaking the retraining required but these have been absorbed in other work within the same firm without difficulty.

Further evidence in support of the use of labour-saving devices comes from the fact that in the past forty years, the man-hours required per unit product (at any rate in the industrialised countries of the "Western" world) has dropped by a factor of over three while at the same time the number of available jobs has risen by over 75 per cent.

It would appear then that automation is something to be welcomed rather than feared and that the engineer should, as always, do all in his power to invent and use any machine which is capable of lowering production costs.

The above is the picture as it stands today but is it a true picture of the future? We are as yet only on the threshold of cybernation, i.e. the combination of computers and automatic machinery. Is it possible that cybernation will in fact eliminate all tasks of a routine or repetitive nature and even most work requiring decision making? There are powerful indications that this may well be so and that in the foreseeable future it will be possible to produce all the goods and services mankind can want with a labour force of less than one-fifth of those who are potentially employable.

With our present attitude to full employment, we tend to regard the possibility of such a state of affairs with horror, but need this be so? Are we correct in our belief that employment for wages is essential to a man's well-being? Could not the wealth derived from cybernation be distributed in such a way as to allow all of those who had no work to enjoy as high a living standard as those who did? Would mankind, in such circumstances be any less happy than today?

For such a "leisured" society to be possible, we will need a complete re-orientation of our educational system to teach man that although he can aim at whatsoever goal he chooses, his greatest happiness can come, as always, only from setting himself a goal which is extremely difficult for him to achieve.

Thus our great task for the future is that "homo sapiens" (thinking man) should teach us to utilise the great gifts which the technological advances of "homo faber" (creative man) are capable of showering upon us. If "homo sapiens" is incapable of solving the problems facing him, we may well find ourselves in Wiener's "decade of ruin and despair".

PRESIDENT'S REPORT

The 1966 Committee had its origin when George Bereznai, Emil Siranovic, and myself, decided to run for positions on the Executive in order to split the load three ways. We each had ideas for improving the Society's program, but none of us was prepared to make a lone stand. The point was that each of us at that stage sadly under-estimated the support we would have from the rest of the Committee, for in fact the load has been split fifteen ways due to the enthusiastic support of all Committee men.

As a result, we have achieved a good deal of our planned improvements to the program. The extra activities we attempted have been reasonably successful to date, although suffering on occasions from rushed planning and lack of support. The solution to the first fault must, and I believe has, come from within the Committee; but the second fault is partly yours -- if you don't like our shows, at least suggest how they can be improved.

Innovations for 1966 included a publicity stunt in the form of a car carrying race, the re-introduction of lunch-hour films, the car trial, visits to factories and construction sites, the revival in more civilized (?) form of the Barbecue, and by no means least, the free distribution of this magazine.

The year began well, with hordes of freshers attending the Welcome to meet Committee and staff members. Then to get the ball really rolling, we held the unique "Car Rumble" in front of the Refec. Other faculties failed to enter but SCIIAES were there in force, and their VW beat our Moke (courtesy Adelaide Motors) after the Engineering team pulled a fumble and dropped the thing.

Ball directors Emil Siranovic and George Bereznai set out to create a more formal Ball this year, and succeeded admirably. The band was appropriate, attendance good, decorations first class, and only the poor acoustics of the Lancelot Stirling Hall diminished the polish of this A-1 show. Our publicity man Ron Riegel-Huth assumed the heavy job of organising our first car trial for several years. There were many teething troubles, but overall the event was imaginative, and attracted some twenty intrepid crews to compete for the worthwhile prizes, and to indulge in the refreshments afterwards.

Visits to Chryslers, and to several construction sites, were well supported, and it is hoped that these will become a regular event. At time of writing more were being arranged for the second term vac. It is also hoped to hold a post exams members only visit to Southwarks or a winery. A drop or two of the good gear was also to be seen at the Barbecue, on which occasion more than three hundred souls ventured into the wilds of Waterfall Gully. Bryan Jenkins and crew put much effort into the revival of this time-honoured event, and with female company from eight hospitals and the Arts School almost equalling the number of bods, all went well. The only trouble was that the Treasurer's rain-dance failed to feature, so the insurance company won out.

The less said about the Tug of War the better ... we lost again ...... Brian Kirke and the team made a worthwhile attempt, but the Meds were just too good. The dinner was still to be held when we went to press, but with our highly esteemed treasurer Hugh Luckhurst-Smith on the organizing side, a vow of a show seems in order -- particularly if the naughty rumours about a 4th year Civil-type floor show are correct. And talking about shows, Dick Wilson is the man behind the projector in the Chapman, and throughout the year has presented us with a most interesting variety of 16mm films. With the large and increasing range of films available from various companies, we hope this will remain a regular part of Society activities.

Which brings us to Hysteresis 1966 -- for a while it appeared as though our finances would not stand the strain, but after much frantic running around in small circles by Ed. Bob Smith, this issue is finally a reality, and in fact may even be distributed free. Either way I wish Bob well in this job, probably the most difficult one of all. This same editor, incidentally, is in his secret identity one of the nation's leading bath-tubbers, and spear-headed the mighty AUES contingent which swept the field in the SCIIAES race in April.

In addition to this varied array, the AUES have this year made moves towards obtaining a student common room, and also more hygienic toilet towels, as well as maintaining many items of routine business, including the Coke machine. On the strength of these activities, I believe this Committee has carried out its responsibilities well, and has set a standard of which it can be proud.

To each of the Committee members, including our "ex-officio" members Pauline and Mrs. Walls, my sincere thanks for making it all possible. To the 1967 Committee, a challenge -- improve on our efforts, eliminate the mistakes, and have an even more successful year.

Bob Burke, 1966 President, AUES.

THE INSTITUTION OF ENGINEERS, AUSTRALIA

(Incorporated by Royal Charter)

Many people outside the profession of engineering, especially students at the University of Adelaide and the S.A. Institute of Technology have sought factual information about The Institution of Engineers, Australia.

The most important function of The Institution is that of a Learned Society and it is in this field that graduates and students can obtain the greatest benefit. Each month a number of meetings on a variety of subjects are held and visits to places of professional interest are also arranged. These meetings and visits encourage personal contact between engineers from different organisations, and with those specialising in different fields, thus assisting the spreading and interchange of ideas within the profession. In addition, meetings on specialised subjects provide ample opportunity to discuss common problems in ones own field.

Graduates and students are cordially invited to all meetings. It is hoped you will avail yourself, whenever possible, of the opportunity of hearing practising engineers speak on topical subjects and of joining in the discussion periods.

As requests have been made for factual information a summary is given below which it is hoped will meet the requirements:-

SUMMARY OF THE HISTORY, OBJECTS AND ACTIVITIES

of

THE INSTITUTION OF ENGINEERS, AUSTRALIA

1. The Institution of Engineers, Australia, was founded in 1919 by the amalgamation of the following engineering associations then existing in the Commonwealth of Australia, namely:-

   The Electrical Association of Australia.
   The Institute of Local Government Engineers of Australia.
   The Engineering Association of New South Wales.
   The Melbourne University Engineering Society.
   The Northern Engineering Institute of New South Wales.
   The Queensland Institute of Engineers.
   The South Australian Institute of Engineers.
   The Sydney University Engineering Society.
   The Tasmanian Institution of Engineers.
   The Western Australian Institution of Engineers.

   In 1926 the Institution of Municipal Engineers of Victoria also amalgamated with The Institution.

2. During 1926 The Institution was incorporated under the Companies Act 1899 of the State of New South Wales as a non-profit association and on the 10th March 1938 it was granted a Royal Charter by His Majesty, King George the Sixth.

3. The objects of The Institution as set out in its Memorandum of Association include the following:-

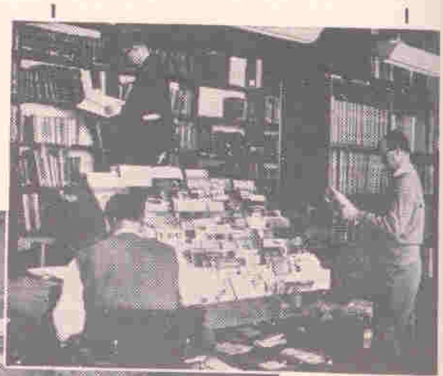
   (a) To promote the science and practice of engineering in all its branches and the usefulness and efficiency of persons engaged therein.

   (b) To raise the character and status and advance the interests of the profession of engineering and those engaged therein, and to obtain power to grant legally recognised certificates of competency.

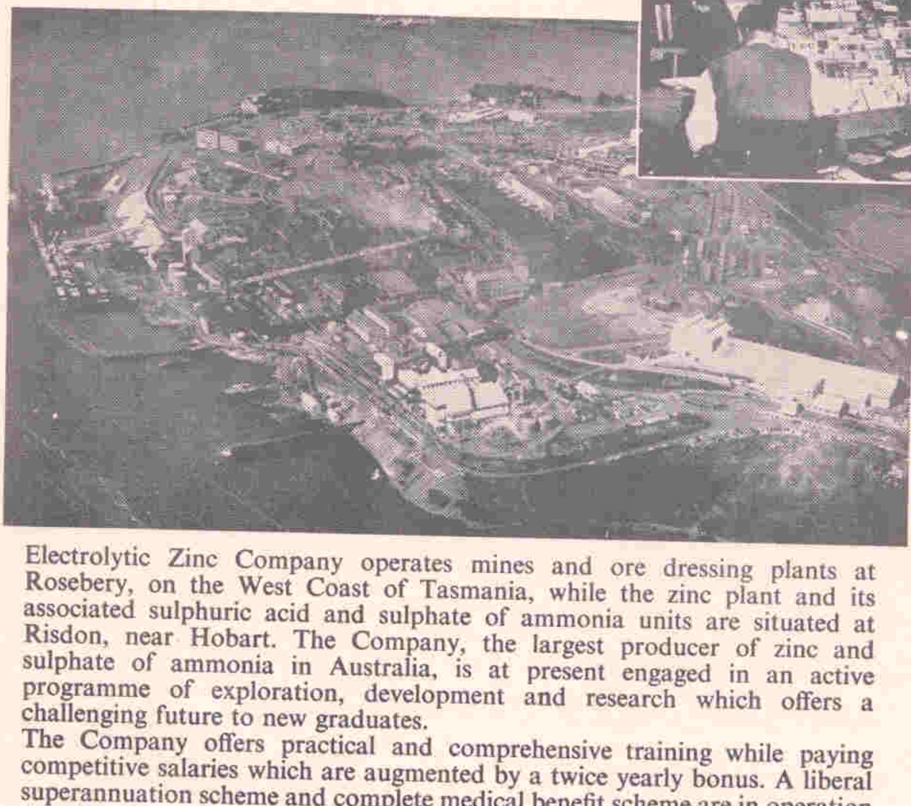
ELECTROLYTIC ZINC COMPANY
OF AUSTRALASIA LIMITED

Graduates (or prospective graduates) in Science, Metallurgy, Geology, and in all branches of Engineering, including Mining Engineering, are invited to consider employment with this Company in the research, plant operation, geological, engineering, or product application fields.

Zinc and Fertiliser Producers



One of the Company's technical libraries



Aerial view of the Risdon Plant on the Derwent River, Tasmania.

Electrolytic Zinc Company operates mines and ore dressing plants at Rosebery, on the West Coast of Tasmania, while the zinc plant and its associated sulphuric acid and sulphate of ammonia units are situated at Risdon, near Hobart. The Company, the largest producer of zinc and sulphate of ammonia in Australia, is at present engaged in an active programme of exploration, development and research which offers a challenging future to new graduates.

The Company offers practical and comprehensive training while paying competitive salaries which are augmented by a twice yearly bonus. A liberal superannuation scheme and complete medical benefit scheme are in operation for all staff.

Further information may be obtained from the Company's Offices at Risdon or Rosebery, Tasmania.

Head Office:
390 Lonsdale Street,
MELBOURNE, C.I.

M6

(c) To increase the confidence of the mercantile and general community in the employment of recognised engineers by admitting to The Institution such persons only as shall have satisfied the Council of The Institution that they have a satisfactory knowledge of both the theory and practice of engineering.

(d) To promote honourable practice, to repress malpractice, and to settle disputed points of practice and to decide all questions of professional usage and etiquette.

(e) To collect and circulate statistics and other information relative to engineering in all its branches.

(f) To provide for the delivery and holding of lectures, exhibitions, public meetings, classes and conferences, calculated to advance directly or indirectly the cause of education in engineering whether general, professional or technical, and to employ lecturers, teachers, and other persons for these purposes and to pay all expenses, professional or otherwise, in connection therewith.

(g) To encourage the study of engineering and to improve and elevate the general and technical knowledge of persons engaged, or about to be engaged, in the profession of engineering and for that purpose to test by examination or otherwise the competence of such persons, and to donate on such terms and conditions as may from time to time be prescribed, prizes or other awards or distinctions, and award certificates and institute and establish scholarships, grants, and other benefactions and to provide for the registration by The Institution of holders of such certificates.

(h) To establish, form, furnish and maintain libraries, museums and laboratories for the purpose of the science and practice of engineering.

(i) To communicate to members information on all matters affecting the profession of engineering, and to print, publish, issue, and circulate such papers, periodicals, books, circulars, leaflets, and other literary undertakings as may seem conducive to any of the objects of The Institution.

(j) To watch over and promote the interests of the profession of engineering generally.

4. There are six grades of membership designated Honorary Members, Members, Associate Members, Graduates, Students and Associates. The Honorary Members, Members and Associate Members are Corporate Members with full voting rights in the affairs of The Institution and may use the title "Chartered Engineer (Australia)".

5. The membership of The Institution at 31st December 1965 was:-

Honorary Members		5
Members		901
Associate Members		11223
Associates		5
Graduates		3789
Students		2838
	Total	18761

These numbers include nearly all the leading engineers in the Commonwealth of Australia.

6. The affairs of The Institution are controlled by a Council, headed by the President, which is elected annually. To enable the objects of The Institution to be effectively carried out, a number of geographical Divisions have been formed, each managed by a Division Committee, and the members electing a number of members of Council.

7. The Divisions at the present time are:-

The Adelaide Division, covering South Australia.
The Brisbane Division, covering Queensland.
The Canberra Division, covering the A.C.T.
The Melbourne Division, covering Victoria.
The Newcastle Division, covering the Newcastle area.
The Perth Division, covering Western Australia.
The Sydney Division, covering N.S.W. except the Newcastle area.
The Tasmania Division, covering Tasmania.

8. Within the Divisions there are sub-divisions of Groups and Branches. The Groups, in the main, are organised in areas distant from the Headquarters of the Division to provide facilities for meetings, symposiums, and exchange of information between members living in the area. The Branches, however, are based in the same location as the Division Headquarters, and provide a meeting point for members interested in specialised subjects of engineering. For instance in Adelaide there is a Mechanical & Aeronautical Branch, an Electrical Engineering Branch and a Soil Mechanics Branch. Subject to a demand from members, branches can be formed to deal with many subjects, such as Management, Hydrology, Education, Highway & Traffic Engineering, Municipal Engineering, Structural Engineering, etc.

9. In addition to the Branches and Groups, most Divisions have a Graduate and Students Section whose aim is to cater specifically for the requirements of Graduate and Student members and to give them the opportunity of obtaining experience in managing their own affairs.

10. Each month The Institution publishes a "Journal" and twice a year "The Transactions of The Institution". These are the official record of technical papers presented to The Institution and of the discussion thereon. In addition the Journal covers matters affecting the interest and status of the engineering profession and includes articles of a technical and instructive character relating to engineering practice and developments. All members (and non-members) may submit papers for publication. Each Division issues a monthly Bulletin which keeps members informed of local happenings and meetings and contains papers presented at Division or Branch meetings.

11. All these publications are supplied free to members. The Journal and The Transactions are accepted by the engineering world both in Australia and overseas as authoritative works of reference. They are exchanged for the publications of other scientific and technical societies throughout the world, which are placed in the libraries of The Institution where they are available for general reference.

12. Owing to its extent and the varied conditions existing in different parts of the Commonwealth of Australia it is important that the standard of competence of those engaged in the engineering profession should be regulated and maintained by a representative and qualified body. The Institution is so recognised by the Arbitration Courts.

13. The academic requirements for admission are normally a university degree in engineering or an engineering diploma from an educational establishment recognised by The Institution. However, The Institution does conduct its own examinations, but permission to sit is normally only granted by Council when circumstances have made it impossible to complete training at a recognised educational establishment.

14. The Adelaide Division has its own premises in Bagot Street, North Adelaide. The main lecture theatre is known as the Chapman Hall, which provides most modern and comfortable surroundings for meetings. There are also facilities for smaller meetings for specialised branches and committees. Either before or after meetings light refreshments are served and during this period valuable, but informal, discussions take place.

15. In conclusion, the main activities of The Institution are concerned with its learned society function, but Division social occasions such as the Annual Dinner, Winter Dinner-Dance, and Christmas Party play an important part in establishing a fellowship between engineers.

FREEWAYS

By J.N. Steele
Final Year Civil

There is, perhaps, no engineering structure which causes more controversy at all levels of the community than freeways. Their location often sparks opposition from families, businesses and industries which have to be re-located, and construction temporarily disrupts residential and business areas. There is also the perennial argument as to whether freeways in fact do anything to solve modern traffic problems or whether they simply create more problems. To meet the transportation needs of a community, a balanced system of facilities is essential. For freeways to serve the public efficiently, they should be properly related to the other elements in the transportation scheme.

Freeways exert an enormous impact on land values and business opportunities. They are closely related to industrial development, community recreation and urban renewal. They save motorists large sums of money through reduced travel time and lower operating costs. Above all, they significantly increase traffic safety, resulting in fewer deaths and injuries and reducing the staggering economic cost of traffic accidents. An American study gives the freeway fatality rate at 2.0 deaths per hundred million motoring miles compared to 4.0 on conventional roads, and an accident rate of 20-50% of that on conventional roads.

CAPACITY AND DESIGN STANDARDS:

The biggest departure of the freeway from the normal street design is in its controlled access feature. Specially designed ramps allow traffic to enter and leave at designated points and over and under passes eliminate intersections. Median strips separate opposing lanes of traffic and pedestrians and parking are banned.

Normal design capacity is 1,500 vehicles per lane per hour, and in fact, for short periods, one lane may take 1,500-2,000 vehicles per hour. This means one freeway lane has a capacity approximately 150% greater than that of normal street lanes, i.e. it would take 20 lanes of normal street to carry as much traffic as an 8 lane freeway (ignoring the speed and safety of a freeway).

Typical design standards are:-

Design speed: 60-70 m.p.h., 50 m.p.h. minimum in inner areas.
Maximum grades: 3-5%.
Lane width: 12 feet.
Median strip: 24 feet, minimum.

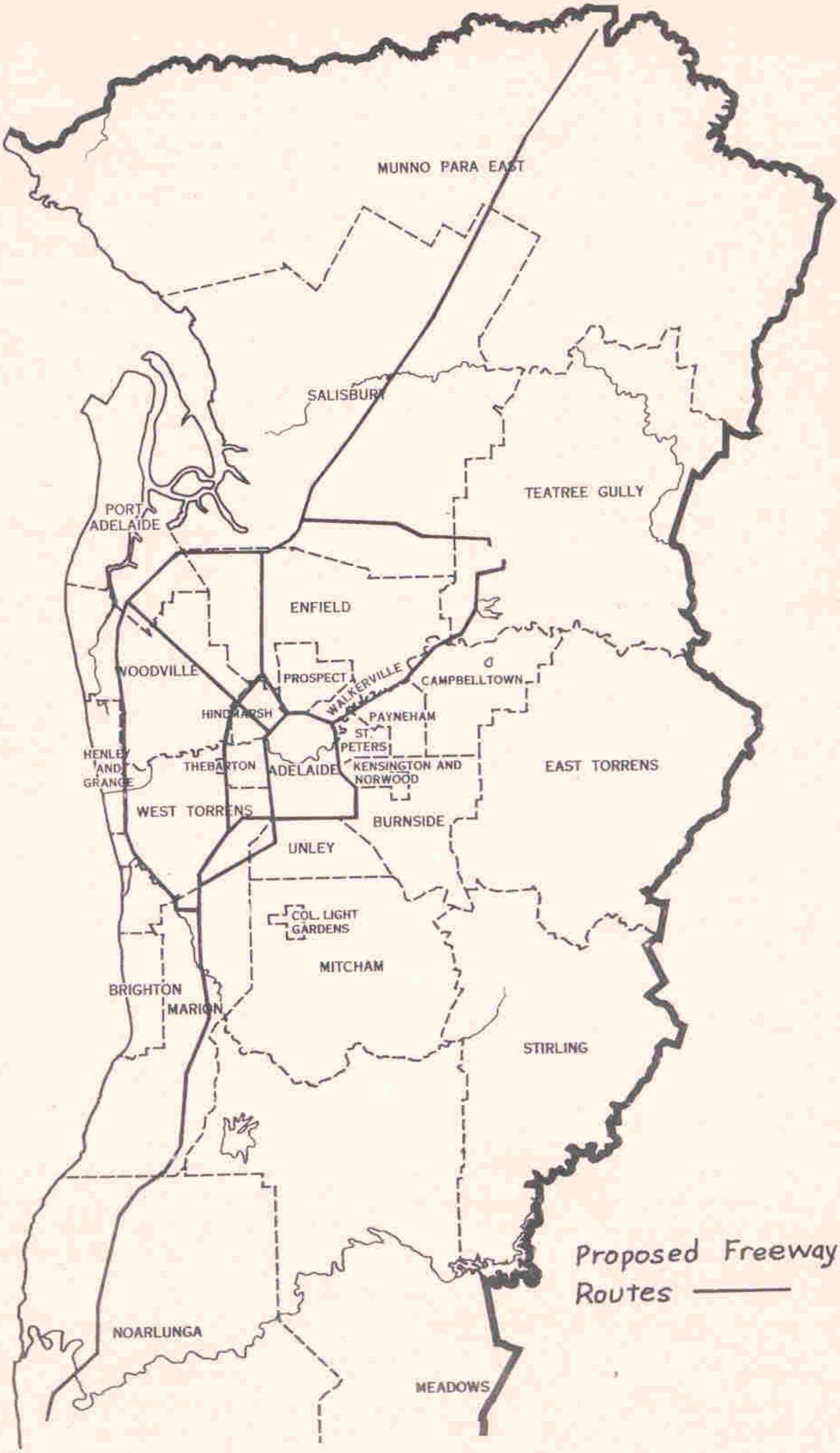
Aesthetic design is important and is accommodated by more than minimum land requisition, allowing flatter side slopes and the planting of trees, shrubs and lawns.

Traffic may only enter and leave a freeway at an interchange. The spacing of interchanges varies from a minimum of about one mile up to a maximum of about 5 miles, depending on whether the freeway is in an urban or rural area.

There are three basic types of interchanges, the diamond, cloverleaf and direction interchange. In a freeway system such as is planned for Adelaide, the diamond interchange would be commonly used. It is the simplest in operation and requires less right of way. The main disadvantage is the intersection conflicts where the ramps meet the cross street. The cloverleaf is normally used only at the intersection of two freeways, or one freeway and an important arterial road.

FREEWAYS IN ADELAIDE:

In 1962, the Town Planning Committee completed its Report on the Metropolitan Area of Adelaide. A large section of this report dealt with Adelaide's future transportation requirements. It was based on the estimated population of 1.3 million in 1991 and from this the transportation requirements for 1981 were estimated.



MUNNO PARA EAST
SALISBURY
PORT ADELAIDE
TEATREE GULLY
ENFIELD
WOODVILLE
PROSPECT
WALKERVILLE
CAMPBELLTOWN
HINDMARSH
PAYNEHAM
ST. PETERS
HENLEY AND GRANGE
THEBARTON
ADELAIDE
KENSINGTON AND NORWOOD
EAST TORRENS
WEST TORRENS
BURNSIDE
UNLEY
COL. LIGHT GARDENS
MITCHAM
BRIGHTON
MARION
STIRLING
Proposed Freeway Routes
NOARLUNGA
MEADOWS

Three surveys were carried out to determine the movement of people and vehicles. A home interview survey of one in every 100 families in the metropolitan area and two in every 100 in the District Council of Salisbury was made. The origin, destination and mode of travel (e.g. car, train, etc.) for trips made by all members of the family, over the age of five, were found for a typical working day. A commercial vehicle survey and a taxi survey were also conducted.

From this information and estimations of future land use and population distribution the amount of travel between areas was estimated. Finally the future travel was assigned to a number of different transport systems in order to find the system which would produce the best service for the least cost.

Four systems were tested. The first consisted of limited improvements to the existing system. In the second, the private car was assumed to be the principal means of travel, with an extensive system of freeways. In the third, public transport was the principal means of transport. The recommended system was one which involves a limited programme of freeway construction and an extension of public transport services.

The system of freeways consists of six freeways with a total length of 97 miles. A large number of major arterial roads will have to be widened and new roads constructed. To cater for increased use of public transport improvements are planned in the suburban railway system and express buses will probably run on the freeways. Parking facilities will probably be provided at the outer stations.

Parking facilities in the city provide a major problem. The Town Planner Report states that 27,000 new car parking spaces will be needed in or near the city by 1981. Exactly how these are to be provided is hard to see.

THE METROPOLITAN ADELAIDE TRANSPORTATION STUDY:

The investigation into Adelaide's transportation needs is being taken further by the Metropolitan Adelaide Transportation Study (M.A.T.S.) which is expected to take two years to complete.

The objectives of this study are:-

1. To determine present and future travel characteristics of Adelaide.
2. To plan public and private transport systems as recommended by the Town Planning Committee.
3. To prepare construction programmes in five-year stages based on needs and revenues available.
4. To estimate the cost of benefits of the various stages.
5. To provide an efficient transport system to meet needs up to 1986.

The study is a joint venture by the Highways and Local Government Department, the Town Planners Office, Adelaide City Council, Municipal Tramways Trust, and the South Australian Railways. Three firms of consultants, one Australian and two American are advising on the study.

The implementation of the study report should ensure the development of Adelaide into a large city, with the high cost to the nation of transportation, the frustrations to the individual and travel in the city, being reduced to a minimum.

Never try to keep up with the Joneses - after all they might be newlyweds.

In a kick, it's the distance . In a cigarette, it's the taste. In bucket seats, it's impossible.

Joe "There's a woman peddler at the door" Jack "We'll take two".

She "Stop". He "I won't" She: Well, at least I resisted.

ENGINEERS AND MODELS

by Prof. J.L. Woodward
Head of Dept. of Electrical Engineering

Apologia

While the author has used the word, "model" in a very general sense, some readers may, nevertheless, consider that he has not fully exploited the range of situations evoked by the above title.

PART I - THE USE OF MODELS:

Aside from the purely recreational or hobby aspects of models, an engineer might use a model to aid his understanding of a possibly complex situation, or to obtain a quantitative solution to a problem by simulation or model tests.

Let us take these two alternatives in reverse order.

Quantitative Answers from Models:

Apart from full-scale field tests numerical answers to engineering problems are normally obtained by solving the sets of equations which describe the actual physical system. These equations may be amenable to analysis by standard mathematical techniques, or may require numerical solution with the aid of hand calculator or digital computer.

In our engineering teaching perhaps undue emphasis is given to the techniques for solving such equations; in practice the formulation of the equations may require a great deal of skill and engineering knowledge. What factors are vital and what can be ignored? The final equations will represent the basic structure with all irrelevant detail stripped away. In deriving these equations, we have, in effect, constructed a <u>Mathematical Model</u> which we manipulate to obtain the required answer.

In using an Analogue Computer to solve the equations the nature of the model is made more explicit because it is usual to connect the elements of the Computer to form a <u>Structural Model</u> of the original system.

Where the engineering system is so complex that it cannot be reduced to a manageable set of equations, we commonly resort to the preparation of scaled-down physical models. The use of such models in the fields of hydraulic and aeronautical engineering is well known.

Models as an Aid to Understanding:

When faced with the task of understanding a field which is new or strange, we must first establish in our minds a framework of core facts about which the complete structure of knowledge can be built. Possibly this process is similar whether one is dealing with a scientific subject or a period of history. In the latter case, the framework might be a memorised list of the Kings and Queens of England, perhaps not a very rewarding exercise in its own right, but very useful to order the sequence of historical events.

In our studies, we must each of us have recognised the need to construct our own summary of the essential facts in a new field, condensing and marshalling them to have the proper relationships to one another. Perhaps it is legitimate to regard such a summary as a rudimentary <u>Word Model</u>. The information contained in this model may be fed into the brain visually, or through the ear by way of a muttered recitation.

The efficiency of the visual channel is much improved if the written summary can be converted into some form of <u>Graphical Model</u>. The <u>Block Diagram</u> is typical of such models. Characteristically these show not only the key elements but also the inter-connections or flow of information. A more refined development again is the <u>Signal-Flow Diagram</u>. In their highest form these Diagrams are in fact a graphical form of the Mathematical Model.

The Analogue or Physical Model:

Most precisely two systems are analogous if they may be described by sets of similar equations. This implies that there is a one-to-one correspondence between the variables and parameters of one system and those of the second system. More generally we think of two systems as being analogous if their behaviours are generally of the same form.

If we can recognise a familiar analogue to some phenomenon which we are striving to master, we may be able to supplement our Word Models and Graphical Models with a Physical Model whose behaviour we already know and understand. Thus when first introduced to the resonant electrical system comprising capacitance, inductance and resistance, the student is assisted by a comparison with the behaviour of a mechanical spring-mass-friction system.

The Model as an Aid to Problem Solution:

As the philosopher Dewey said: "It is a familiar and significant saying that a problem well put is half-solved. To find out what the problem is and problems are which a problematic situation presents to be inquired into is to be well along in the inquiry". The construction of a viable model of the process or phenomena is, in many cases, a vital step both in formulating the problem with clarity, and then in testing for a possible solution.

PART II - A CASE STUDY: MODELLING A FERROMAGNETIC DOMAIN WALL

The Domain Concept of Ferromagnetism:

The idea that a lump of iron consists internally of a very large number of microscopic bar magnets dates back a long way, but an understanding of the nature of these microscopic magnets has developed only during the present century. These magnets are in fact tiny current loops, the most important of which are due to the spin of individual electrons about their axes as they orbit about their atomic nuclei.

Should these spin magnets all be aligned by an external magnetic field the metal acts as a single powerful magnet, but only in the small groups of ferromagnetic elements Iron, Cobalt and Nickel is a high degree of alignment attainable under normal circumstances. In fact, in ferromagnetic materials at room temperatures adjacent spin magnets are aligned even in the absence of an external magnetic field. The overall magnetisation of a specimen may yet be zero, however, due to its division into small volumes known as "Domains". Throughout a given Domain the spin magnets are parallel, but the magnetic axes of the Domains may be oriented in a random manner, resulting in zero nett magnetisation of the specimen.

Among the factors which govern the Domain pattern within a specimen are the crystal structure, specimen geometry, presence of impurities, and stresses due to manufacturing processes or external applied forces.

A good deal of attention has been paid to the properties of the "Domain Wall", the narrow region separating adjacent Domains. Figure 1 indicates the structure of a 180° Wall of common occurrence in modern grain-oriented cold-rolled magnetic steels. There is a continuous rotation of the axes of adjacent spin magnets through the wall, a typical wall having a thickness of approximately 150 atoms.

In magnetically "soft" materials changes in magnetisation at low and medium flux densities are brought about chiefly by movement of Domain Walls. In most applications, it is important that the forces resisting this motion should be as small as possible in order to minimise the power losses where the magnetic flux is continuously changing. It is customary to devide the losses into an "eddy-current" and a "hysteresis" component, the former due to the circulation of induced e.m.f.s. and currents as Domain Walls sweep through the material. The nature of the hysteresis component is not well understood but is primarily due to the "coercive force" which resists wall motion even under near-static conditions where the magnitudes of the eddy currents are vanishingly small. Reduction of these losses is of considerable economic importance and while some success has been achieved in the development of low-loss magnetic steels, theoretical treatments of the observed loss phenomena are far from satisfactory.

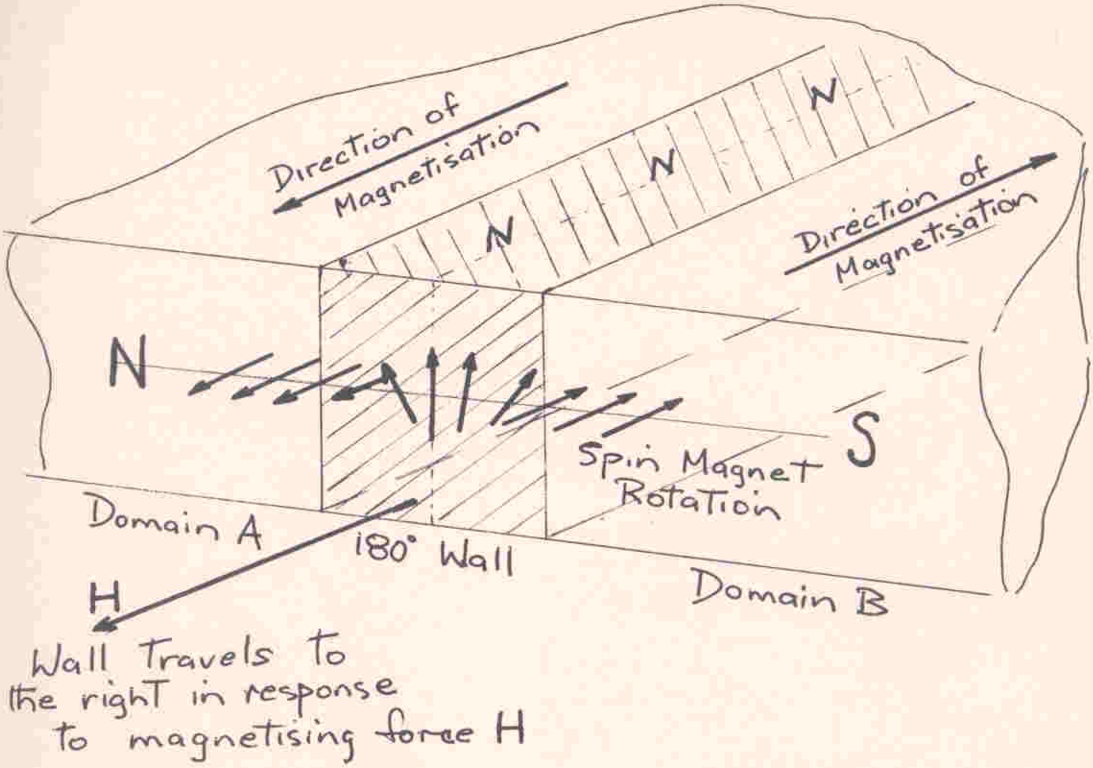


FIG 1 180° Wall Separating Oppositely-Magnetised Ferromagnetic Domains.

Model of a Domain Wall:

The domain structure in any but the most perfect specimens is very complex and this renders calculation difficult. Moreover under dynamic flux conditions the way in which the various domain wall forces interact has not been thoroughly investigated. It was this latter situation which led the author to devise the mechanical model of a single domain wall which is sketched in Figure 2. Such a model has, in fact, been built, although its real function has been to clarify the basic concepts, and physical existence of the model is not really necessary.

The model consists of a light metal disc carried on a shaft rotating in frictionless bearings. Rotation of the shaft corresponds to linear motion of the domain wall through the specimen. Motion of the wall is brought about by an applied magnetising force, having as its counterpart in the model the driving torque provided by the weight, string, and pulley. Induced eddy currents retard motion of the wall, and this is modelled directly by having the disc pass between the poles of a fixed permanent magnet. The action of these currents is that of a viscous damping force whose magnitude is proportional to velocity.

The wall is subject also, however, to a force akin to that of Coulomb or "Dry" friction, where the magnitude of the retarding force is independent of velocity, but is always in a direction to oppose motion. Such a force is produced in the model by a friction pad. The wall has preferred positions within the specimen which recur in a more-or-less cyclic manner, and this gives rise to periodic forces on the wall tending to move it to one of these preferred or stable positions. The star-shaped cam and spring-loaded follower reproduce this condition in the model.

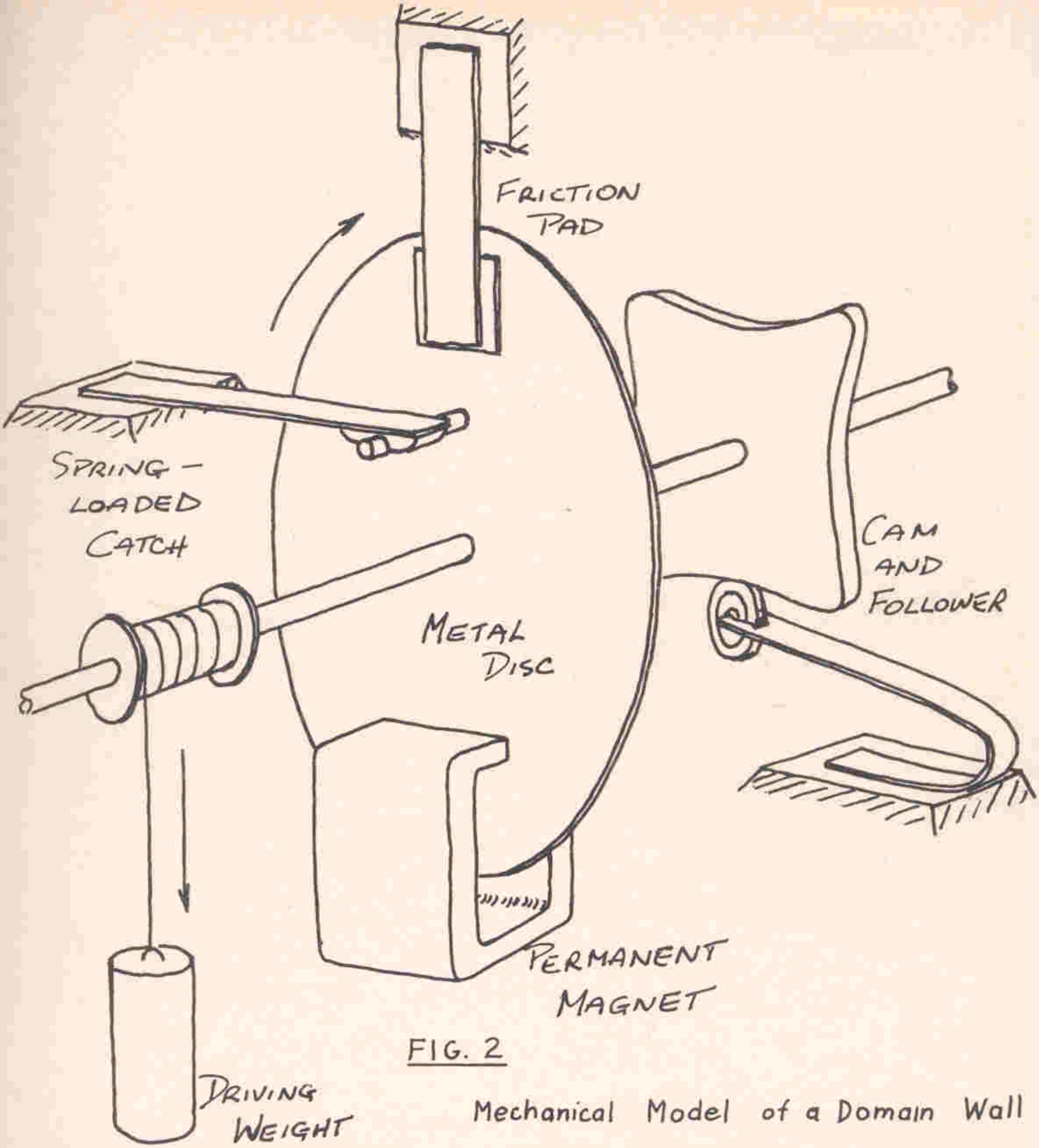


FIG. 2

Mechanical Model of a Domain Wall

Finally, when the wall excursion is such that it meets a surface of the specimen or is annihilated by a wall proceeding in the opposite direction, a finite value of magnetising force is required to re-create the wall, and this effect is simulated by the spring-loaded catch of Figure 2.

There is, at present, little direct experimental evidence to guide one in an assessment of the relative importance of these phenomena in their effect on overall losses. It is, however, possible to adjust the parameters of the equations governing the domain wall model until the closest possible fit is obtained between calculated and measured loss values, and the results of such an investigation have been reported in a recent publication.

While it cannot be claimed that a satisfactory understanding of this problem requires reference to a model of the nature described here, the insight afforded by study of a readily-understood analogue is extremely valuable in such a complex situation.

ELECTROMAGNETIC LEVITATION

(Or HOW TO MAKE A SAUCER FLY)

By G.W. Trott
Final Year Electrical

"A hum filled the air. It rose to a crescendo as a great silver object slowly rose in the air and hovered there seeming to defy gravity. Then ....." A quote from Science Fiction? Maybe, or perhaps just a description of what is known as electromagnetic levitation.

What is electromagnetic levitation, you ask? This is simply a means of levitating, or floating a body using electromagnetic fields.

Levitation over the years has been associated with magic and mystic rites. Here a person seems to lie suspended, usually horizontally, on nothing and seeming to defy gravity. I cannot attempt to explain how this is done, except that it is most probably an illusion. However, there are several physical properties which could be applied to make a levitator.

One simple way is to suspend a table tennis ball at the end of a stream of air, but I think that this is not quite what is required and so the condition that material contact is not necessary is imposed.

However, there are still five methods which could be used. Consider, first, the gravitational field. Here we have a repulsion between bodies due to their mass. However, if the densest material known on earth (platinum-iridium alloy) was used, the effort would not get off the ground (literally) until the diameter of the sphere was about one-quarter that of the earth's. Thus, apart from space travel, this is only of academic interest. Speaking of space travel, this requires continuous rotation to keep aloft and, so, is not quite what is wanted.

The second method is by reaction forces as per Newton's law. This requires a continuous expenditure of matter for a continuous force and, so, is rather impracticable. The third method is by radiation pressure. As all well-informed scientists know electromagnetic radiation, i.e. light exerts a pressure on a body on which it infringes. However, this is a rather inefficient means, as it requires 1.5 M.W. of power, probably equivalent to all the street lighting in Adelaide, all concentrated to lift one grain of material.

The penultimate method is by stationary electromagnetic fields, like the repulsion between two north poles of a magnet. As everyone knows, this is not a very stable way of supporting an object and, in fact, will only work if the magnets are constrained so they are free to move in one direction only. Thus, they do not qualify. However, using superconductors, it is possible to suspend objects in these fields.

Finally ... wait for it ... we have quasistationary electromagnetic fields, or, as anyone without a plum in his mouth would say, varying electric and magnetic fields. By a process of elimination, we have arrived at what seems the only practical way of suspending an object, or the only way which is not ruled out. How to achieve a levitation system using this theory is now the problem.

There appears to be two methods: one using electrical conductors in alternating fields, or by using fields which can be varied by a feedback system which applies a correction as the object tends to leave the field. Well, of course, all the budding electrical engineers see 'feedback' and say, 'that's the way'. However, it is easier, I think, to use the electrical conductor in alternating fields.

How does this work? Well, it involves the eddy currents being set up in the conductor by the varying magnetic field interacting with the magnetic field to give a force, and, by some strange chance, the left hand rule tells that the force on the conductor is upwards. This means that, provided the force is large enough, the conductor will lift from its support.

However, lifting is easy ... it is still necessary to stabilise the conductor so that it remains in the lifting field instead of acting like a super-ball on the crest of a hill. This is dône by using two windings to supply the field, one of which does the lifting and the other gives a field 180° out of phase, which, by careful analysis, can be shown to stabilise it, but more important, in practice, it does stabilise it.

The conductor used, of course, should be one of the metal type conductors and has to be greater than a certain size. In fact, the conductors used were made from aluminium of 1/8" thick and about 8" radius.

As can be gathered from the preceding paragraph, a system was built during the first term this year and proved to be a great success (it worked). It has a cylindrical symmetry in its windings and measured about one foot in diameter. It consisted of two circular solenoidal type windings, which were concentrically placed in iron laminations, which were radially arranged.

If you now know what it looks like you are a genius.

It used 50 c/s excitation and about 7 amps. in one coil and 3 amps. in the other (technical details).

It was found that by varying the phase of the stabilising coil as well as the current that various modes of stability could be obtained. Among these were tilting and oscillation. The force on the disc was quite large, of the order of several pounds, and anyone knowing about the effect of eddy currents would realise that the disc became quite hot.

All sizes and shapes within reason could be supported, as long as they were thick enough. The smaller discs took up a position off the central axis of the machine. While the large circular discs were suspended, they were free to rotate and appeared to have only windage losses to slow them down. This appears to suggest that such a machine would make a good frictionless bearing.

However, the device is in the process of being made presentable and then will be used as a demonstration model and, presumably, would be prominent at the next Open Day.

THE SCRAM JET

by M. Pledge
3rd Year Mechanical

The advent of the supersonic transport has opened a new realm for high-speed commercial transportation. It is feasible that by the year 2000, sub-orbital, orbital and very high speed and altitude flights within the atmosphere will be commonplace.

At present, chemical rocket propulsion is the main method used to accelerate a vehicle to the hypersonic speeds required for orbital, sub-orbital and very high altitude flights. Rocket power is very expensive, however, not only because the fuel itself is expensive to produce, but also because so very much fuel is used in the initial acceleration, when the efficiency of a rocket is lowest. Added to this, the non-reuseability of the stage vehicles for any space mission means that the costs become exorbitant.

In space a rocket must carry an oxidant as well as fuel, but within the atmosphere, air can be used as the oxidant, thereby allowing an enormous saving in the take-off weight of any vehicle. The vehicle then requires less power for acceleration and in turn uses less fuel. The vehicle can then carry more fuel for longer flights or be made larger.

If we consider a booster vehicle designed to carry a space vehicle from the ground to a very high altitude and speed, from where the spacecraft can be launched into orbit under its own rocket power, we find that two forms of power plant are required. The first would need to operate efficiently from zero speed at take-off to a low supersonic speed. The second would be then required to accelerate the vehicles to a speed just below the 'escape velocity'. The first requirement can be met by use of turbojects with reheat (or afterburners). The second could possibly be met by the use of conventional ramjets, except that the efficient operating flight speed of these is generally limited to about Mach 9 (9 times the local speed of sound).

The design of a conventional ramjet is such that the supersonic free airstream is collected and decelerated by the intake to some subsonic speed. The air is then fed into the combustion chamber where some fuel is burned. The resultant hot air and combustion products are then accelerated through the exhaust nozzle to provide thrust. Unfortunately, as the free airstream Mach number increases, the pressure and temperature of the air at the inlet to the combustion chamber approach the stagnation temperature and pressure of the freestream air. (See fig. 1). After combustion, the temperature of the air is above the dissociation temperature of the combustion products, and this dissociation (even with the partial recombination in the nozzle region) gives a marked drop in efficiency of the engine.

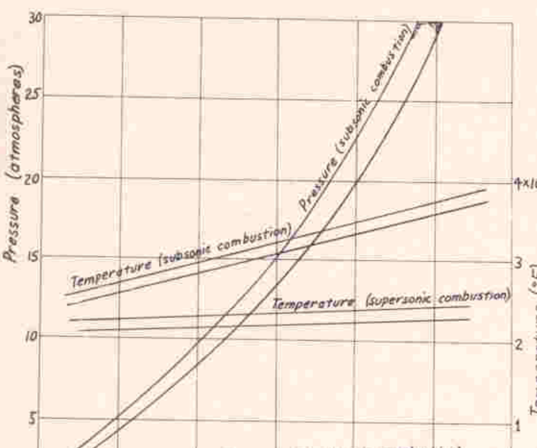


FIG 1 Relationship between temp. & pressure condition, at the inlet to the combustion chamber of a ramjet utilising subsonic & supersonic combustion, & the flight Mach no.

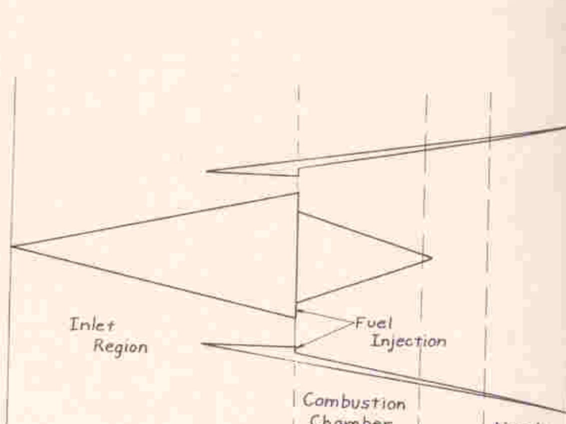


FIG 2 Schematic Diagram of fixed geometry, constant pressure, SCRAM-jet.

These high temperatures and pressures can be avoided if the air entering the combustion chamber is only decelerated to a low supersonic speed. In this case, the temperature and pressure after combustion can be maintained at a reasonable level and dissociation is negligible. Hereto the problem has been to maintain a stable flame in a supersonic airstream. Two solutions to this are the use of a continuous sparking ignition system, or the insertion into the airstream of a weak oblique shock wave, which will raise the temperature of the fuel-air mixture to its flash-point, thereby causing ignition.

Once a stable combustion has been achieved, the designer of a SCRAM jet, or supersonic combustion ramjet, faces another problem in the design of the combustion chamber and exhaust nozzle. Unlike a turbo-jet or a conventional ram-jet, there is no set line of demarcation between the nozzle and the combustion chamber. Even if a variable geometry intake with its associated design problems is incorporated in the engine, the efficiency is adversely affected. If the engine is designed such that constant pressure is maintained within the combustion chamber and nozzle, it appears that the engine will operate over a greater speed range than it would if other design criteria were used. The probable shape of such a fixed geometry, constant-pressure engine is illustrated in fig. 2.

Figure 3 shows a comparison between the operating efficiency of a SCRAM jet with those of a conventional ram-jet and a turbojet with reheat (afterburner).

By the use of a variable geometry intake, a SCRAM jet can be designed to operate at speeds in the low supersonic region about Mach 4. In this case, it may be possible to design a vehicle to operate efficiently at all speeds from take-off to very high supersonic speeds. This would require the utilisa-

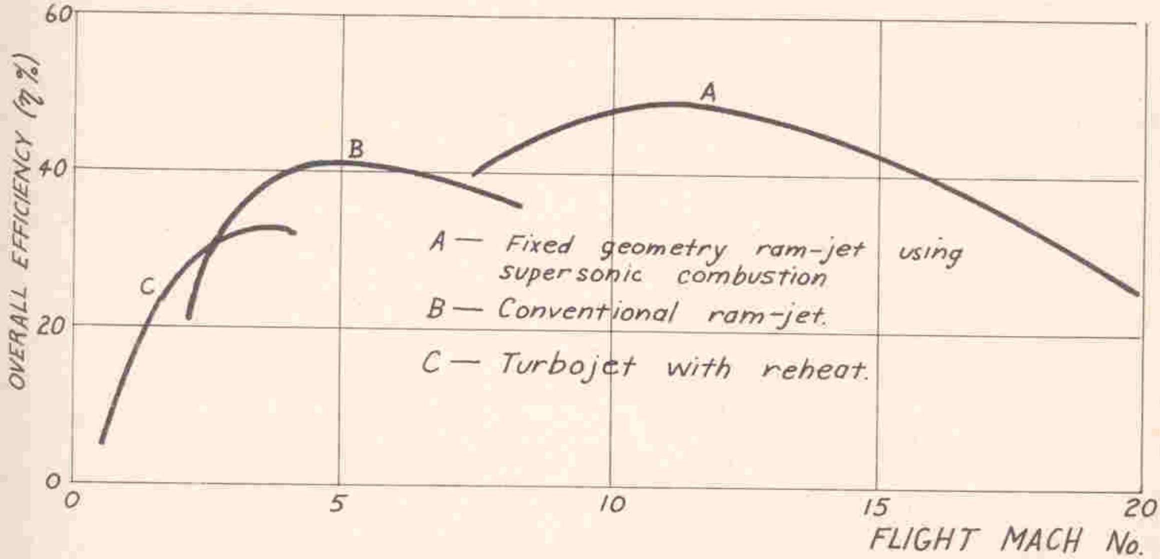


FIG. 3.

tion of a turbo-jet or jets for the low speed phase of a flight and of a scram-jet to be phased into operation at about Mach 4, and used to obtain flight speeds of Mach 12 or higher.

Unfortunately, at speeds in the hypersonic region, the structure of any vehicle becomes subjected to very high temperatures. To maintain the strength of the structure it is then necessary to provide some method of cooling. With the space vehicles in use at the moment, this is achieved by the use of an ablative process as on the Gemini vehicles, or by the use of a heat sink as is used in some ballistic missiles. These methods are, however, only practicable when the flight within the atmosphere is of short duration. For a prolonged flight within the atmosphere by a hypersonic vehicle some other method must be found.

On certain liquid hydrogen fuelled rockets the structure of the combustion chamber and nozzle is cooled by cycling the fuel through cooling tubes in the structure before it is fed into the combustion chamber. Since liquid hydrogen is an excellent fuel for the scram-jet, this method of structural cooling should be adaptable to a hypersonic transport aircraft.

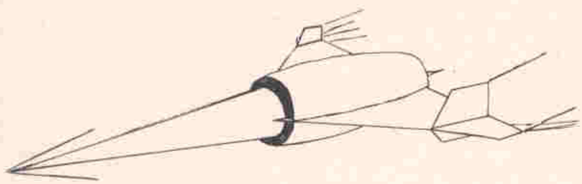


FIG. 4

FIG. 5

Possibly in our lifetimes we will see aircraft similar to those sketched in figures 4 & 5 standing on the tarmac of an aero-spaceport.

References: Astronautics & Aeronautics April 1966 page 80
" " October 1965 page 54
" " August 1964 page 32
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Aeronautical Engineering June 1966 page 36
" " February 1966 page 15

PAPUA-NEW GUINEA: OUR RESPONSIBILITY

by Brian Kirke
Local Papua-New Guinea Officer
Final year Civil

One of the last areas in the world to feel the influence of European civilization and made up of half a big island plus a maze of smaller islands, all within 12 degrees of the equator and dissected by rivers, mountain ranges and swamps, this land of difficult communications, warlike tribes and little economic promise was naturally left until last by the colonial powers. When they did come late last century, it was more for political than for economic reasons, and there was little incentive to develop the interior, so that with the exception of some of the more accessible and fertile coastal strips where plantations flourished early, Papua and New Guinea experienced little colonialist exploitation.

The opening up of the interior was done mainly after World War I by government patrols, who brought law and order in most cases with a minimum of bloodshed, and by Christian missionaries who tried - and are still trying - to bring health, education and the Christian message in place of the old principle of eat or be eaten. The success of these groups has in general been remarkable. Eighty years ago the people were divided into numerous mutually hostile tribes, each making war with its neighbours, whom, it appears from early patrol officers reports, they regarded as the worst kind of devils. There were about 700 different languages (not dialects) among the 2 million people, whose world mostly consisted of a valley bounded by towering mountain ridges beyond which lived hateful enemies.

By 1962, 95% of the country was under the control of Local government councils. Tribal loyalties are now fading away and with the exception of occasional outbreaks of violence, the people live in peace. Few countries with a white minority having a large measure of control over a primitive indigenous majority can boast of such good racial relations. Visitors from Africa and Asia have been amzed - and indeed frustrated - to find so little discontent. A visitor from India could not believe that there were no stockades to hold the political prisoners, and Mr. Mboya, Kenya's Minister for Justice, was surprised at the faith of the New Guineans in Australia.

EVEN HELICOPTERS MUST EAT

But the Territory is still far from self-supporting. Cash crops are few, industry negligible, educational standards low, and few of the people have an understanding of their country in relation to the rest of the world - indeed many still know little beyond their own valley. The people of New Hanover, an island barely thirty miles long, want to buy President Johnson and make him their ruler. In his book "Assignment New Guinea", Keith Willey describes how, as recently as 1964, villagers in a remote area saw helicopters for the first time and "tried to feed one machine sweet potato and crawled all over it in an attempt to discover its sex before accepting it as a cousin of the familiar balus, or aeroplane".

DIFFIDENT

Although these examples may sound amusing to us, they indicate a frightening lack of awareness of the 20th century into which these people have so suddenly been thrust and in which they may very soon be independent, whether they - and Australia - like it or not. Australia, in contrast to the Dutch in neighbouring West New Guinea, or West Irian as it now is, neglected the education of an indigenous elite and concentrated instead, on widespread primary education. The Territory's first university is just starting this year. There are a few other tertiary institutions in the Territory and a handful of Territory students in Australian universities, but the people as a whole are unfamiliar with a great deal that is taken for granted in "developed" countries. Most are diffident about assuming responsibility. You can walk into the police station in Pt. Moresby and be confronted by an immaculately uniformed Papuan, apparently full of confidence and in complete control of the situation, but any non-routine enquiry is immediately referred to an Australian hovering in the background. The same sort of thing happens in the shops. One hopes that the Papuans and New Guineans are learning the ropes and gradually taking over positions of authority, but very few seem to have taken over as yet.

In the House of Assembly there is a minority of twenty-six Europeans out of a total of sixty-four. Six of these were unexpectedly elected in open competition with indigenous candidates, a result which could be regarded as a vote of confidence in the Australians, or alternatively as a vote of no confidence in the indigenous candidates.

WAGES CUT

The recent drastic reductions in wage and salary scales for indigenous public servants, introduced to make the scales compatible with the economy of the country, was a blow to those with ambition and an ugly example of racial discrimination which caused widespread discontent and disillusionment.

There are strong reasons for the changes, namely:-

(1) Expatriates are needed to develop the country because there are not yet enough skilled indigenes.
(2) Not enough expatriates can be attracted unless the salaries offered are higher than those in Australia.
(3) The economy, even with large scale expenditure by Australia, could not stand universal salaries as high as those in Australia.

But such logic is not much comfort if you are a Papuan who works on the roads in Pt. Moresby for 6 or 8 dollars a week and sees Australians who sit at desks in air-conditioned offices, get paid ten times as much, drive their own cars and can afford to get drunk every night. You naturally doubt the gushing statements so often made that "Australia is only in the Territory to help ...."

NOT EUROPEAN

In January of this year, at a work camp in Hanuabada village, Pt. Moresby, a Brisbane girl was digging a large hole in very hard ground. A villager came up to her and said "You're not a European - you're a Papuan".

The fact that he could not imagine a European woman doing manual work speaks for itself. I think we can draw a moral from this story - that many more young Australians who don't mind work are needed to go to Papua-New Guinea, not for material gain from the high expatriate salaries, nor out of charity or a sense of mission to enlighten the heathen savage, but because there is a job to be done there that is worth doing. Here are the makings of a nation, and the attitudes of that nation are being formed right now.

Will our nearest neighbours in the turbulent and largely anti-European region of South-East Asia say, as the old man said during the 1964 elections, "Thank you Australia too much. Now man belong New Guinea, him strong allsame man belong Australia", or will they say "You Australians rans (get out)", like the rebels on New Hanover?

The New Committee

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		Peter Ochota	(Civil IV)

OK You Elec, Mech and Chem clods, how about trying to take over the Society.

ACCIDENT WATCHING

by A.J. McLean
Engineer; Accident Research Unit

For the past three years or so I have been looking at accidents. Now this pastime is different in certain important respects from bird watching. Not only does it involve fewer risks; it also provides a steady income and occasional opportunities to travel. For the next three years I shall be looking at accidents in New York State at the invitation of Cornell Aeronautical Laboratory.

I was rather surprised that the folk in the "great land of the West" should have to bring an engineer from Adelaide to look at their accidents. But Bob Campbell, the head of the accident research at CAL, assures me that only about half a dozen engineers have made a close study of traffic accidents at the scene. There have been correspondingly few projects mounted with the sole purpose of looking at traffic accidents, and few of these projects have been successful.

There are many problems associated with work of this type. The engineer's perennial problem of having to depend on the co-operation of others is very real in this work. If you haven't already met a foreman who can grit his teeth and say nothing very loudly then it is a certain pleasure in store.

An equally as serious problem arises from the ways in which people commonly view accidents. An accident is very nearly the only event which otherwise reasonable men will call an "act of God". The next stage in our understanding of accidents is often expressed by the phrase "people cause accidents". Certainly human behaviour is related to accidents, but it may sometimes be a very remote relationship. Boiler codes, for example, aim at preventing accidents by modifying the behaviour of the people who design and build the boiler.

But these two attitudes combined can quite convincingly cover almost all accidents. And so accident research is rarely considered to be a "respectable" field of study. It is interesting to compare this attitude to that which we now adopt to disease. Only one hundred years ago an epidemic was considered to be an "act of God". The scientific study of disease and epidemics had produced such successful results that, in the more developed countires, this attitude has almost entirely disappeared.

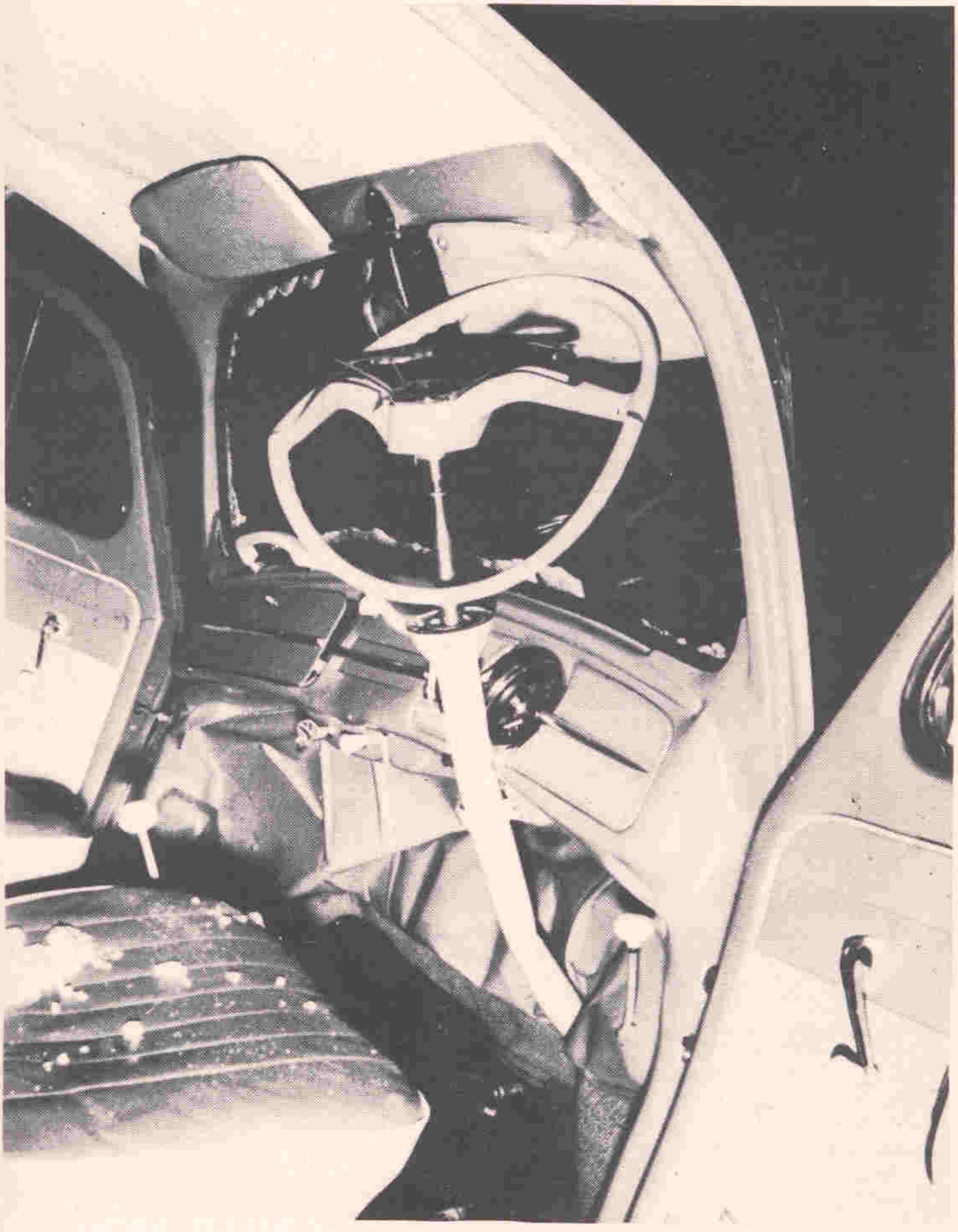
It has only recently been realised that there are very many parallels between disease and accidents. Polio and road accidents are striking parallels. Both have been confined to the more developed countries, and both have arisen in this century. Polio has been controlled, road accidents have not. But it can be argued that whether or not a person ingests a polio virus is a matter of chance; in other words, an accident. Polio has been controlled by minimising the damaging effects of that virus. The development of the seat belt is virtually an exact parallel. Wearing a seat belt is unlikely to greatly improve one's chances of avoiding an accident, but it will greatly minimise the injurious effects of an accident.

This is only one example. Virtually every stage of the causation and effects of any accident has its direct parallel in a disease process. The new and developing techniques of accident research are therefore being closely modelled on the methods that have been successful in the study and control of epidemics.

Here a further problem arises. The study of epidemics demands a detailed examination of all factors which may have any bearing at all on the epidemic. This at once goes beyond the bounds of any one academic discipline. The work of the Traffic Accident Research Unit over the last three years was confined to medical and engineering aspects. This meant that I was the first engineer to be appointed as a research fellow in the Department of Pathology.

Scientific investigation is usually taken to mean the study of a specific variable, or set of variables. Accident research is still in the stage when comparatively few of these variables have been identified. The nature of studies such as the recently completed Adelaide one, and that proposed at Cornell, has been compared to Darwin's observations in the field which provided the basis for his theory of evolution. Now I am not suggesting here that accident research will prove that people are evolved from accidents. I am trying to point out that just as modern biology is based on Darwin's observations so accident research can only hope to progress if the more formal studies are based on variables that have been realistically and wisely chosen.

Some of the variables that have been identified are quite obvious, others less so. Generally such variables can be classified into one of two groups; those that lead up to the production of an accident, and those that determine the effects of an accident. In the case of road accidents very many of these variables are the direct concern of the engineer.



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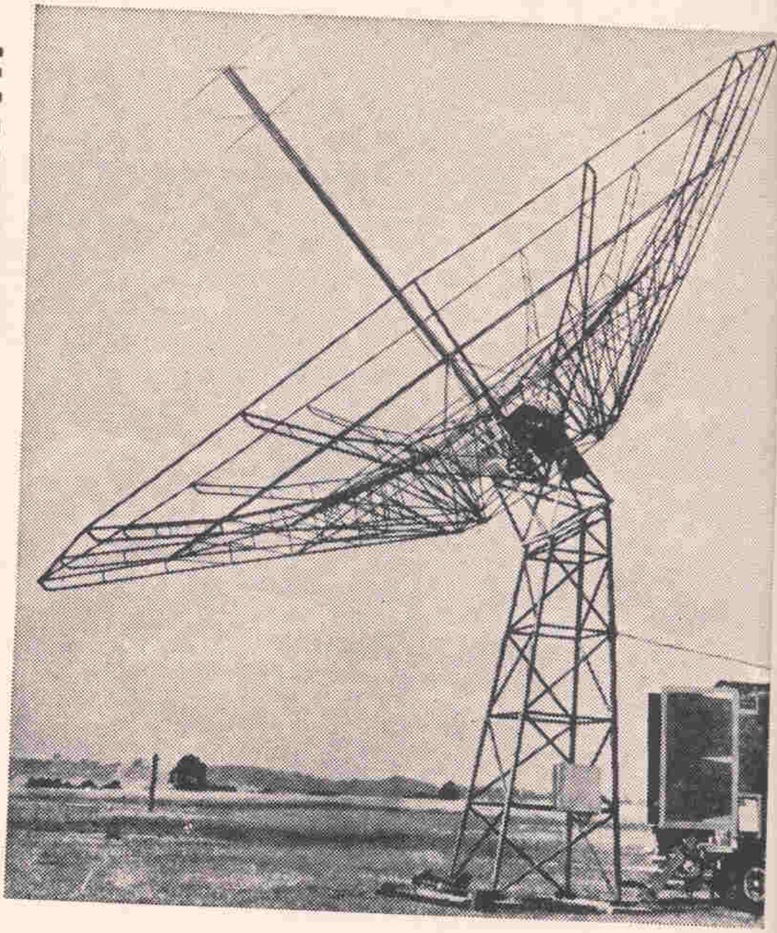

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Skid resistant surfaces are the concern of the highway engineer. If he accepts the fact that accidents are likely to happen he will also concern himself with crash barriers and the impact properties of other road side objects.

The traffic engineer will ensure that his control systems are within human and vehicular performance limits. If you do not understand what I mean by this take a tape measure and a stop watch out to Gepps Cross; measure the width of the intersection and the length of the stopping amber period, and then do a few sums. The motorist also relies on the traffic engineer to tell him where to go. Road signs should therefore be positive and not negative. It has even been facetiously suggested that the No Entry sign should be changed to read Go Away.

The vehicle designer has the obvious responsibility to present a roadworthy vehicle. This includes not only aspects of vehicle stability but also ease of control. The car should be designed to suit the man, not vice versa. For example when the driver turns the steering wheel clockwise it is reasonable for him to expect the car to turn right. The stylists have not tried to change that one, but tinting windscreens is almost as ridiculous. How cutting down on the available light makes it easier to see at night has not yet been explained.

The crashworthiness of vehicles, which is only beginning to be emphasized, is also the responsibility of the vehicle designer. Crash worthiness can briefly be summarised as follows: keep the occupants inside the car, make the passenger compartment strong enough to minimise the risk of it being crushed in on them, and minimise the deceleration forces which result from the occupants being thrown against the interior of the passenger compartment. The first two of these concerns relate closely to the behaviour of structures under dynamic loading. The final concern is similar but also involves the response of the human body to impact. This work has become known as biomechanics, and demands close liaison between medicos and engineers to determine the nature, magnitude and duration of decelerations which cause injury to various parts of the human body. As these limits become known so the design of energy-absorbing materials and structures can proceed. A good example of such a structure is the crushable steering column which will be standard equipment on most American cars next year.

There are not, at the present time, many opportunities for an engineer wishing to specialize in work on accidents in this country. The main difficulty appears to be a political one, in the general sense of the word. Because such difficulties have in the past been resolved almost overnight there is some reason to hope that opportunities may soon be more readily available. Every engineer, if he does any work at all, will inevitably be faced with the problem of accidents. If his understanding of accidents goes beyond the "act of God" or "people cause" stages then his chances of handling them effectively will be very much increased. For those who like books there is a large one on accidents in the Barr Smith Library. Its title, naturally enough, is "Accident Research".

I never could resist a bargain. That's why I took such a big interest in this letter to a London newspaper that I caught sight of the other day. Wanting to sell a hole a man had recently dug in his front garden, he lamented the fact that he had been unable to sell it in one lot. As soon as he dug it he had received inquiries from several gentlemen, each of whom was looking for accommodation for his mother-in-law. But, requiring the purchaser to take the hole away, the negotiations fell through. Eventually he borrowed a saw and divided his hole into 36 smaller holes, each one foot square. "I sold 24 of these without too much trouble to the GPO for use when erecting telegraph poles," he said. "Now I have 12 left and would be glad to offer these to readers at cost price plus carriage. To comply with postal regulations regarding size of parcels, the holes will be compressed prior to dispatch, but will readily resume their shape and size when immersed in a bath of water for 24 hours," he added. I did hear, from unofficial sources, that Australia was sadly lacking in ready-made holes. But, even if they were allowed out of England during the current austerity campaign, I can't see the Australian immigration and customs authorities letting them in. Never know what's been in them.

WAVE THEORY AND SURFING

by Chris von der Borch
Dept. of Geology

Board surfing is currently one of the fastest growing sporting activities, rivalling snow skiing in technique, following and enjoyment. Since the development of modern, light-weight, fibreglass covered polyeurethane foam boards, technique of "playing the wave" and "getting the most out of a wave" have advanced a hundred-fold.

The prime interest of a surfer is the wave. He desires it to be "glassy", with a hollow top-to-bottom break, peeling off at just the right speed along the crest as the wave advances shoreward. The ultimate sensation in surfing, therefore, is for the board-rider to keep as near as possible to the breaking part of the wave, thus riding the steepest portion of the "green water". In other words, the nearer he is to pending annihilation, the hotter the ride.

If he surfs the same locality frequently, one thing the observant surfer notes in particular is the fact that never are two periods of swell the same, the term "period of swell" in this context meaning waves from one particular storm source. Such a "period of swell" or "high surf", for example, may occur about every 2 weeks, and last for several days. The surf that may rise at nother time, from another storm source, in general has quite different properties to the surfing conoisseur. The following few points from recent physical oceanographic research will throw some light on this enigma.

All waves are formed by the action of wind stress on the ocean's surface. For given wind velocities and "fetch" (the distance of ocean over which the wind in question blows), the height of the resulting swell is predictable by mathematic formulae. Theory shows that "fetch" is an important factor, and a broad storm area with medium velocity winds may ultimately produce a larger ground swell than a small intense storm.

At the storm centre, choas reigns, with waves of all frequencies, amplitudes and directions interfering. However, the waves ultimately radiate out from the storm centre in all directions in a manner analogous to ripples from a stone thrown into a pond. The shorter "period" waves rapidly lose their energy by interaction with surface tension, etc., and only the long period swell, or wave motion, persists at great distances from the storm. These travel at velocities of the order of 25 to 30 m.p.h., with longer period (lower frequency) swells outstripping the slower short period ones. A natural sorting-out and cleaning-up of the swell thus occurs. Ultimately these messengers from the storm arrive at a distant shoreline, anything up to 8,000 or 10,000 miles from the storm, and up to 2 weeks later. These are the ideal waves of the surf-seeker. Local weather will be independent of the storm, with perhaps glassy conditions or offshore winds.

The so-called "long-period swells" (12 to 18 seconds between crests) from remote storm centres, as described above, have interesting properties. They are not very evident to an observer on a ship offshore, as they are broad low undulations of the ocean surface. However, because of their long wave-length, they "feel" the retarding effect of a shoaling seafloor in deep water, far offshore, and begin refracting and focusing their enormous energy. Certain shapes of sea-floor topography act upon these waves in a manner analogous to a lens on light waves, causing the energy to focus (converge) on certain areas of the coastline and diverge on others. Because of this, some areas may have high energy waves breaking (the surf-seeker's "hot spots") whilst nearby areas may be almost flat calm. Obviously the many variables that exist, such as storm distance, intensity, and direction, explain why given surf-spots change from time to time.

One day we may be able to predict, with the necessary accuracy, storm positions and intensities on any part of the globe. This, coupled with a detailed knowledge of bottom topography, and a refined wave theory, should enable us to determine, perhaps 2 weeks in advance, our ideal surf beach. Perhaps the surfer of the future will be fully equipped with a miniaturized computer installed in his board, which may be directly keyed in to weather-satellite reports, and programmed to predict when and where "surfs-up". This computer may even digitize and store the information of how many toes he hangs over the end of his plank.

ACTIVITIES IN THE CIVIL ENGINEERING DEPT.

by R. Culver
Reader in Civil Engineering

In the past year the Department has been active in both research studies and in investigation and development projects for Government Departments and industry. These have ranged from studies aimed at understanding the behaviour of 20 miles of beach to the stresses occurring in a lead ladle with a filled capacity of 10 tons.

During 1965 further model studies of various sections of the Chowilla dam were undertaken in the Hydraulic laboratory. These studies were of special appertenances for the Dam, namely a fish ladder (designed for velocities acceptable to the fish through each compartment) and a river outlet model calibration to enable the required river flow downstream to be accurately established after the dam is built. These were small sectional models installed in flumes which would not have been visible to the casual observer. More likely to be seen were further studies conducted for the Highways & Local Government Dept., of portions of the South Western Suburbs Drainage scheme in a beach outfall model study required to dissipate some "900 H.P." in flood waters and cross the beach with minimum damage; a "structure" of a very carefully designed hole lined with large stones (prototype approx. 7 tons each) was ultimately recommended; this gave good dissipation of the flow energy and distributed the water to the beach uniformly. A further all perspex model of a complex drain intersection enabled the performance to be more accurately assessed than calculation could predict. Now under construction in the model bay is a spillway model for the new Kangaroo Creek Dam. This new design supersedes the original one which was rejected by the design engineers of the Engineering & Water Supply Department on geological grounds, because the rock was not sufficiently sound. The new design is for a rock fill dam with a side channel spillway and this model study will help the Design Engineers ensure that the behaviour of the spillway is as required under full flood conditions and to see if any economies in design can be achieved.

A significant piece of theoretical work on the elasto-plastic behaviour of steel under complex combined loading conditions is having practical verification to very high orders of accuracy. Very high quality steels have had to be used to get carefully controllable properties and great precision in the production of the test specimens has also been necessary. A great deal of effort has gone into this work which is adding to our knowledge of behaviour of steels under these high strain conditions.

The "Devil's Cauldron", a structural model study of a 10 ton lead ladle has just been completed. The stress paths in heavily loaded ladles of this type when being lifted and tipped are quite complex. Calculations cannot always give a complete picture and by using structural models appropriately loaded these matters can be very adequately investigated. The Department has developed a very useful castable modelling material of an epoxy resin filled with calcite for producing models of this type. As is usual with any study of this type strains in many locations are measured with electrical resistance strain gauges.

The recording of these strains from many sections in such a study is a tedious and slow business manually and the Department has just completed a 99 channel strain gauge logger which switches to selected channels in order and types out on an electric typewriter the channel identification number, the sign of the strain, and up to five figures of signal "data". This promises to be a very valuable recording tool for the Department. A further logging device of this type is under design feeding data to a paper tape punch so that data can be directly fed to a computer for processing via paper tape.

A large scale study of the Erosion Problems of Adelaide's beaches is now gaining momentum. Detailed sand sampling and analysis throughout the whole of the metropolitan beaches has been completed; a hydrographic survey of the coastal strip 2 miles wide north of Pt. Malcolm has been completed in an attempt to assess any significant changes over the years since the establishment of the Outer Harbour mounds. The suitability of radar procedures for current survey work is being assessed together with other methods of current measurement and wave recording. Sand tagging procedures using fluorescent sand have been tried with certain limitations and limited use may soon be made of radio active sand. This work is part of a large continuing research programme of the stability of the metropolitan coastline.

A large scale study of sprinkler irrigation is showing a new precise design approach of optimum systems. The significance of wind, the diversification of irrigation schedules, the rapid assessment of irrigator heads on an automated testing station (at Adelaide Airport) have enabled these very considerable advances to be made. The work on jet dispersion, sprinkler drop size spectra and high performance irrigator heads continues.

RESEARCH IN CHEMICAL ENGINEERING

by C.R. Phillips

Research is currently being conducted on aspects of gas-liquid flow and dispersed solid-liquid flow, heat transfer to boiling liquids, a thermodynamic approach to decompression sickness in divers ("the bends"), the control and response of packed bed or tubular reactors, stress-corrosion in metals, and digital computer-on-line control of a chemical engineering process.

Local heat transfer coefficients are being measured for two-phase flow in a heated annulus. A mixture of vapour and liquid is fed into the bottom of the vertical annulus, and expands in volume as it is vaporized, thus accelerating the upward flow.

High speed cine' and flash photography are being used to investigate the entrainment of droplets from a liquid film flowing co-currently with a gas stream down a vertical tube. As a result of the gas drag forces, waves are set up in the liquid, and droplets torn off from the wave crests.

The differential sedimentation of particles of two different species is being studied by using radio-isotopes to measure their concentration and velocity. Ion exchange resin beads are being used as the tagged media. The velocity data will be used to check a theory based upon the Navier-Stokes equation of hydrodynamics.

The Cirrus computer is being linked, via a digital-analogue converter, with a simple process: the blending of two liquid streams. The process will thus be controlled directly by Cirrus.

A thermodynamic theory of decompression sickness is being tested on rabbits and goats in a decompression chamber. The theory postulates random nucleation of gas bubbles, an unsaturation which increases with absolute pressure and control of the transport of gas by diffusion. Heat transfer and pressure analogues have been built to solve the complex mathematics involved.

A correlation of particle-fluid drag coefficients has been established for the settling under gravitational acceleration of single spherical particles through a Bingham plastic fluid. Velocities were measured by tagging with radio-isotopes.

The stability of packed bed catalytic reactors to perturbations in flow, temperature or concentration of reactants is under investigation. At present, the best mathematical model for transient heat transfer to a packed bed is being determined.

Finally, the stress-corrosion behaviour of titanium and zirconium alloys is being studies. The specimen will be kept stressed and in contact with the required electrolyte solution. As cracks develop and propagate, they will be watched microscopically, and the extent of corrosion will be measured by passing an electric current through the electrolyte-metal system.

RESEARCH IN THE ELECTRICAL ENGINEERING DEPARTMENT

by B.R. Davis
Lecturer in Electrical Engineering

The following are brief descriptions of research topics of current interest in the Electrical Engineering Department.

ANTENNAS AND PROPAGATION:

Work in this field generally involves studies on the properties and design of antennas for different purposes. For instance, studies are being made on multimode feeders for parabolic tracking antennas using circular waveguides, and the effect of defocussing as a means of improving the acquisition time.

Other projects involve the reduction of back radiation from cheese antennas by the use of crenellations, the study of long wire antennas for aircraft navigation and problems in the blind landing of aircraft and the provision of localiser signals.

An investigation is also being carried out on the factors affecting fading in microwave communication links. This is of particular interest because of the increasing use of microwave telephone repeaters. Radiation from vertically polarised antennas over surfaces of high dielectric constant is also being studied.

COMMUNICATIONS:

Work is in progress in the study of high efficiency angle modulation systems, such as the phase-locked loop and frequency compressive systems. Analysis of these systems is proceeding with the aim of optimising their performance under varying requirements of acquisition behaviour and threshold performance.

DIGITAL TECHNIQUES:

It is hoped that eventually it will be possible to program a computer directly by simply speaking to it or perhaps giving it handwritten instructions. There are many problems in the achievement of such a goal, not the least of them being the provision of suitable interface equipment to enable direct communication with the computer. Problems on this latter aspect are at present being studied.

An investigation into the design of computer central processing units is being made with the aim of improving the speed and efficiency with which the facilities of a computer are used.

MEASUREMENTS:

Methods of high accuracy automatic position determination with possible application to the control and measurement of machines, machine tools and civil engineering equipment are at present under investigation. Accuracies of the order of .05" in 50 ft. are being sought. High precision angular measurement using optical interference patterns has been one of the developments from this investigation.

MEDICAL ELECTRONICS:

Activities in this field include the development of an RF probe for creating controlled lesions in the brain. This is used in the treatment of Parkinson's Disease and it is thought that the probes developed are a considerable improvement on previous ty.pes.

In conjunction with the Physiology Department, a study of the application of control theory to neurophysiological problems is being made. Nervous systems are known to have feedback in the same manner as servomechanisms, and, hence, it should be possible to explain the behaviour of such systems in terms of known control theory.

NETWORK THEORY:

Many methods are available for the synthesis of filters if the terminating impedances are equal. For simple cases, it is possible to modify the elements so that operation between unequal impedances is possible. An extension to more complex filters is being sought.

POWER SYSTEMS:

Of particular importance in a power system is a knowledge of behaviour of the system under fault conditions. Digital computer methods are being developed for the analysis of the transient stability of complex power systems.

A twin stator synchronous induction motor is being developed which should provide a variable speed characteristic without significant torque variations. A novel asynchronous reluctance motor using variable reluctance and ferro-resonance effects is also being studied.

SELF-ORGANISING SYSTEMS:

It is hoped to prove the feasibility of devising a machine which will act as an intelligent teacher by simulating the evolutionary process. For instance, it should be possible to build a machine capable of teaching a child the time.

In addition to the above topics, methods of high density information storage are being studied in conjunction with the Physics Department. Densities of the order of 10^6 bits per square millimetre are being aimed at using thin film techniques.

RESEARCH IN THE DEPARTMENT OF MECHANICAL ENGINEERING

by H.H. Davis
Professor of Mechanical Engineering

Research work is being actively pursued in a number of areas which include the following:-

1. Ducted impeller propulsion for large ships is under investigation at model scale in the research water tunnel. The aim is to develop a system free from the severe vibratory components of thrust, torque, bending and pressure field of a free-water propeller operating in the asymmetric wake at the stern of a ship. Results are encouraging and sophisticated computer programmes have permitted impeller design to achieve propulsion efficiencies as good as or better than the best free-water units. Experimental studies will check the theoretical work.

2. A primary source of noise in aircraft at high sub-sonic and supersonic speeds is that generated by boundary-layer turbulence on the skin of the aircraft. A special wind tunnel is being developed for study of boundary-layer turbulence and its excitation of panels and of possible methods of control. This phenomenon is also important in many other fluid flow situations.

3. Aerodynamic noise generated by axial-flow and centrifugal-flow fans and blowers is a persistent problem in air-conditioning and ventilation, hovercraft, helicopters and other situations. A fundamental study of the mechanism of noise generation by the flow over aerofoils and ad-hoc studies of the parameters influencing noise generation in fans is proceeding.

4. An extensive study of various aspects of aerostatic and aerodynamic lubrication of journal and thrust bearings is being made on a number of rigs. Progress has been made in the new idea of tapered-land bearings to give greater stability and less exacting manufacturing tolerances. Air-turbine driven rotors have been run at speeds over a half-million r.p.m. with adequate torque for units from dental drill size up to small industrial drilling and grinding units.

5. Studies of the acoustic absorption characteristics of glass-fibre and foamplastic wedges of various configurations are proceeding to determine optimum characteristics for the lining of the anechoic chamber in the acoustics laboratory. Interferometer studies have shown advantages of the glass fibre units, and an attempt to protect operatives from fibre shedding by micro-thin polythene film envelopes is under study.

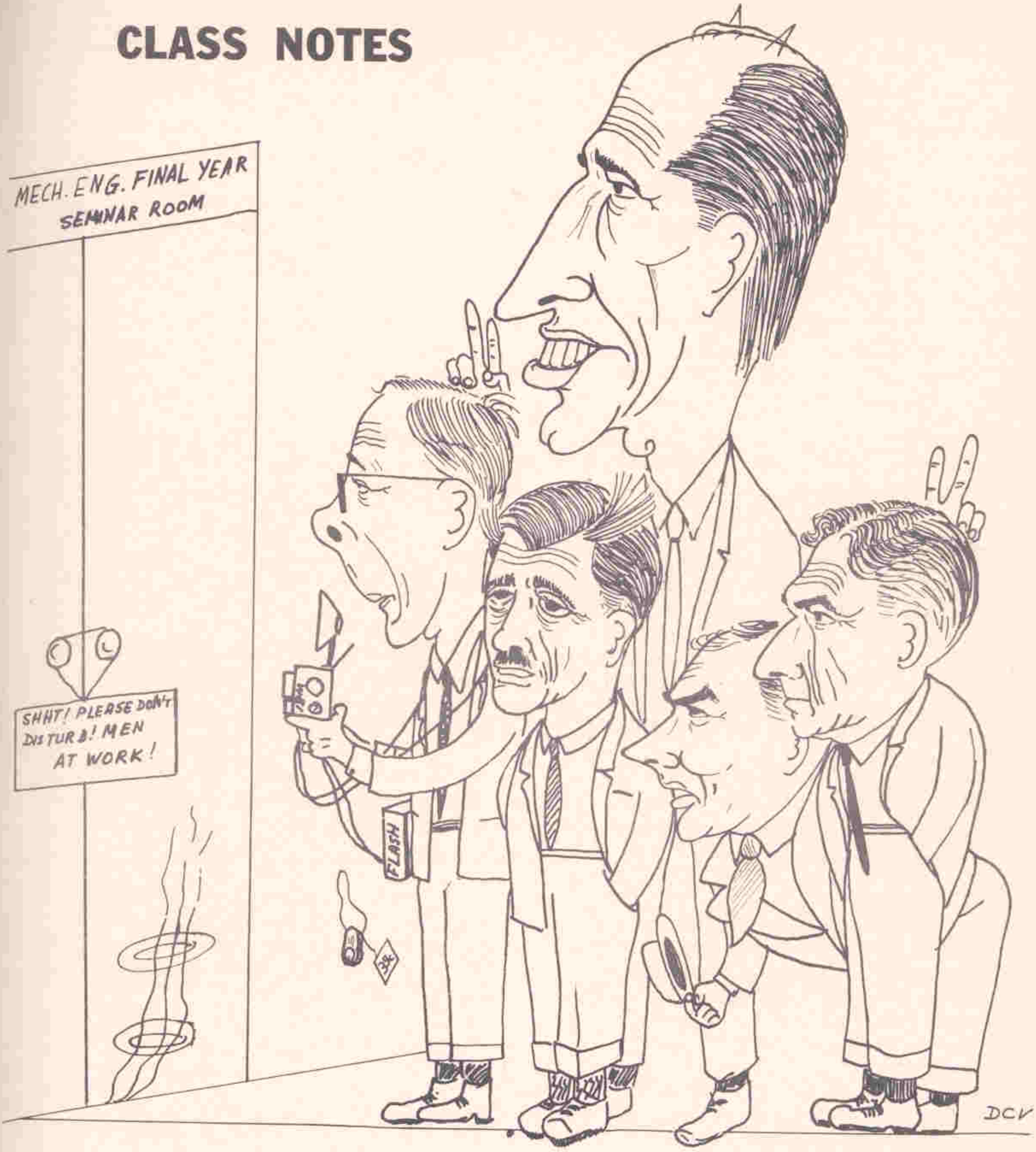
6. Attenuation of shock-waves in the exhaust systems of two-stroke internal combustion engines is under study with a water-table analogue and with gas flow in shock tubes with Schlieren photography. The apparently conflicting requirements of high shock and acoustic attenuation with minimum volume, and low pressure-drop for the mean flow component, are being examined.

7. A new approach to environmental control in both the air-conditioning circuit and automatic control system has been developed. A simpler and cheaper system giving greater refinement in precision and range of control of temperature, humidity and air flow is being incorporated in a new prototype artificial growth control chamber (Biotron) for the Waite Agricultural Research Institute.

8. A number of heat-transfer studies are continuing in important areas of Thermodynamics. These projects involve free convective, unsteady flow (including shock-waves) and explosive gaseous combustion conditions.

Other projects include studies of vehicle suspension feedback control, control of wind-induced tall chimney stack vibration, the internal damping properties of visco-elastic materials for vibration and noise control and the development of a combined exhaust spark-arrester and silencer for tractors and other vehicles. Several patents have been taken out during the year and a number of papers published on the foregoing topics.

CLASS NOTES



—I heard them talking about Pants' Humidifier and T.H.R.U.S.T. and Exhaust and....
—Shall we break in and catch them in the act? If the I.B.M. 36944075H1 is right, then...
—You've got to be very careful; they...they are dangerous!
—Come on, let's teach them the centrifugal twisting Polka.
—Seriously, I have quite a few points to make.

4TH YEAR CIVIL

The most unique feature of the Fourth Year Civil men this year was that one wasn't (good Engineering grammar). We were pleased to welcome Ann to the class; her presence throughout the year necessitated a quick glance before forcibly expounding one's point of view.

The year started with only two short preliminary lectures, definitely a false indication of the work ahead. In the Fourth Year Civil course, one has the doubtful pleasure of a choice in subjects. Those who had 'it' chose Eng. Maths III whilst those wo didn't (and probably didn't want 'it') accepted Economics I (Eng.). Unfortunately many of those who embarked upon Eng. Maths III soon became seasick when they were assimilated into the Applied III doctrine, under the piercing glance of that champion of statistics (whats the probability of five aces?), Dr. Keats. However, yet to come was Mr. Capon, a man remarkably adept at rubbing out his own writing before anyone could find the mistakes, let alone copy it down. What a shame Mr. Sved went for a holiday this year.

Meanwhile in Eco. I the lads were subjected to 'Happy Healey', a 'beer and steak' man, who thought every latecomer to lectures was an engineer. His words of encouragement caused many freshers to drop out before third term. On Wednesday, GNP's, PDY's and SEX were the 'in' topics for those still awake after ten minutes.

Hydraulics lectures were informal, to say the least, but despite the efforts of 'Hydraulic Jack', few students managed to keep their heads above water. The lab. experiments gave mediocre results, but some unofficial ones undertaken by the more turbulent groups yielded startling results (especially on the faces of the innocent victims).

Mech.Eng. S revealed that designers are supposed to go around in circles, aptly illustrated by Mr. ('Batman') Norrie's lectures. However, one must admit that the end of the conveyor (design) was the high spot of the year. Brakes and clutches, a subject in which Mr. Fowler expressed much personal interest, came under the close scrutiny of those anxious to improve their technique in this field.

Instrumentation, regarded cautiously at first, soon developed into a series of riotous lectures. The Culverism, "Dammit man, use a computer", brought with it the problem of $30x10^{10}$ punch cards and little men perpetually carrying them on trolleys. Someone suggested using magnetic tape then if any problems arise, "a little Bear will fix it".

Nevertheless, the year would be incomplete without Civil 1, and our three "Big Daddy's"; DHT, DBC and TAF. The understanding of Civil 1 has often been described as the starting point on an engineer's road to success. With due apologies to the above mentioned, most of us are still searching for direction signs. DHT delivered a few good stories plus an excellent reproduction of the last five years lecture material on structures, whilst DBC showed signs of diagonal tension due to the stress of his first year in concrete. The "Grand Old Man", TAF, in his final year, informed us that to be a successful engineer in the field one must be familiar with all types of dirt.

On the social scene, the lads were quite active, certainly proving that BMC aren't the only ones who "float on fluid". Copious amounts of amber liquid were consumed especially by one of our number (no names, please) at his twenty-first. Oh well, what goes down must come up. The football match against the Electricals proved their resistance too small for our rigidity and structural strength. Our contribution to the arts came at the Annual Dinner, with the presentation of the play, "Slenderella", vigorously acclaimed (?) by all present.

However, thanks must go to all the lecturers for tolerating us and still managing to smile, what fortitude. Our only wish is that we are all together again next year (in final year, please.)

"Blackbeard"

HØORAY FØR FØURTH YEAR CØMPUTER TIME

```
   JØB 717, BØØM, 100000
   FØRTRAN LX
   PRØGRAM BØØM
C  PRØGRAM FØR CIVIL S CRANE BØØM DESIGN
   CØMMØN NBG
   REAL SWEAT
   DIMENSIØN SWEAT (10 GALLØNS), PATIENCE (INFINITE), CØFFEE (43 BEANS)
   READ (60, 12) INFØ
12 FØRMAT (LAST YEARS NØTES)
   DØ 20, I=6, 12 PM
   CALCULATE LENGTHS
   CALL QUIKPLØT (DRAW, 20 x 30 SHEET)
   FIND ØUT MISTAKES
   DØ 21, I=1, FED-UP
21 RUB ØUT
   RE-CALCULATE
20 RE-DRAW
   IF (PØSSIBLE) 30, 40
30 STØP
40 GØ TØ HELL
   END
   FINIS
   LØAD, 56
   EQUIP 1
   RUN, 100000, 200000
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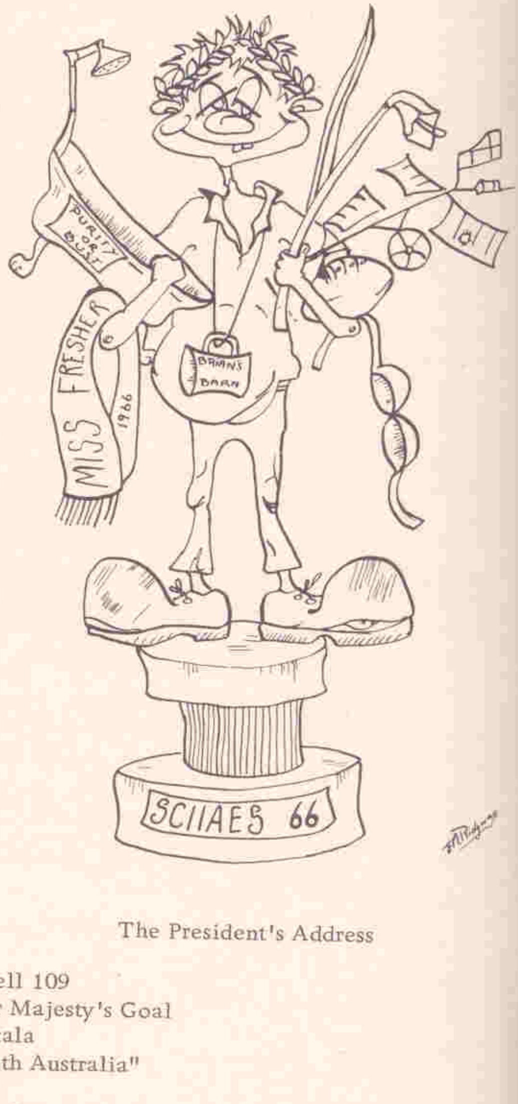
SCIIAES

PURITY PAGE



The President's Address

"Cell 109
Her Majesty's Goal
Yatala
South Australia"

The President's Speech:

Surely this year must go down as the year of the Purist. Four hundred and twenty purists have come forward and pledged allegience to the cause, slightly more fellas than girls.

Part of the course included half a dozen organized tours of the flesh pots of Adelaide. This is quite a difficult feat, as originally Adelaide didn't have these half dozen shows. Having the girl members added realism too, (four, six ....).

The committee that led the campaign (Not necessarily in order of merit):

ROBERT FRY (Ex-President):	"Giddy Pinnacles of Power, Bah - Self imposed slavery".
MIKE ROACH (Pub. Manager):	"Next time I' ride a broom its gotta be side-saddle".
BRUCE BEAUCHAMP:	"Don't touch me Ralph, I'm Sterile".
BRUCE RILEY (Disco):	"And in the beginning God created Discotheque".
BRIAN PRIEST (Treasurer):	"Even the receipt book is on hire purchase".
PENNY BLACKBURNE (Vice-President):	"I am <u>not</u> conservative. I <u>do</u> believe in free love, but ...."
ANGELA FISHER (Disco):	"Did I pay the Chain Gang this week??"
JULES LEWICK:	"I'm an idea man; I think I'm gonna chuck".
BRON DAVIS:	Left us nine months ago. Last seen at G.E.H.
DICK VENUS:	"Technology Students have the biggest balls" - August 12th.
PETER DAVIES:	"I'm finally mounted on a hot one".
CLIVE WINKLER (P.R.):	"I've just got hold of a 5xQB7.5. Where's the beer?".
ROBIN LAIDLAW:	"My 19th was a real swim-through. Pass the towel".
BARRY JOHNSON:	"Hell dad. This drunken fire hydrant swerved onto the road and hit the car".
ANEE DUNN:	"I'll drink any man under the tables. Jees its dark down here".
JOHN PEZY:	"I know when I'm drunk; this is definately my last flagon".
MICK GARDINER (Sec.):	"Wheres that bloody Hannaford. I'll murder the B...".
JOHN HANNAFORD (President):	"I feel like a brawl; I remember that time up in Mt. Isa ....".

The cancellation of our one fund-raising show, the Purity Cabaret was a great disappointment. We feel that our disappointment could only have been exceeded by the dear souls at Angas Street who had so kindly prepared accommodation and tour of the court establishment on an all expenses paid (by us) basis.

My parting advice is "Be pure as the Lily". If you persist in wanting to end it with a bang, ring 23 2424 and ask for Lily.

Your most humble and obedient servant.

John H.

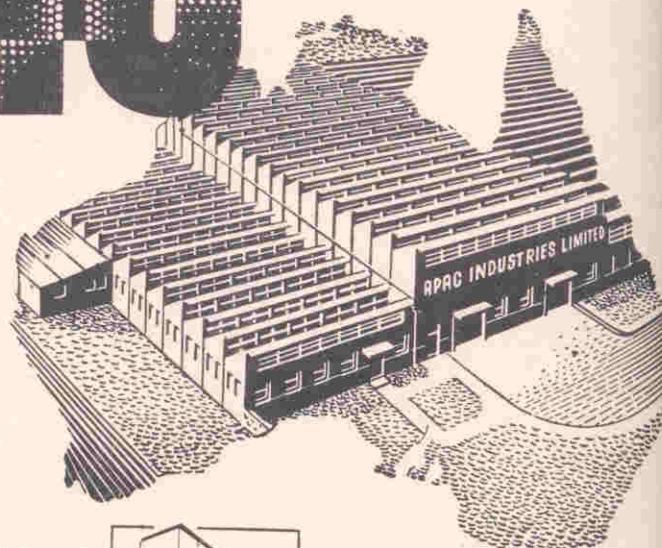
SCIIAES '65 completed its' activities for the year with the end of Prosh. The Prosh Breakfast was held on the small island in Lake Veale in the parklands. Although the chops arrived late, the breakfast was the usual roaring success. None of the constabulary dared enter the island, since we had named it "SCIIASIA" and declared oursleves a republic. Any intrusion on the part of the police, and we would have immediately appealed to the UN for military aid. That year we were also responsible for two of the most hushed-up (by the police) stunts pulled off.

No. 1. The townward-bound trams from Glenelg had trouble getting up the grade at Forestville because of grease on the tracks. While hidden observers watched with bated breath the first and second trams slowly crawled up, with the wheels spinning madly. However they managed to spread the grease further along, so when the third tram appeared on the scene, it had even more trouble gaining the top and then as if in reply to the many expectant looks observed on SCIIAES faces, it slowly and majestically slid down to the bottom.

No. 2. Angas St. No. 1. SCIIAES secret agent carrying extremely large smoke bomb cunningly concealed in airways bag, steps into elevator. Holding door open with one hand, lights fuse with the other and then pushes buttons for all floors. Secret agent makes cool, unhurried exit, while elevator stops at first floor, doors open and great clouds of smoke billow out, blanketing the corridor. Doors close, elevator goes up one floor and repeats process. Thus the whole building receives a taste of Prosh while the elevator continues on its automatic way, sharing out the smoke equally to all floors.

Early in '66 it was realized that SCIIAES was in danger of falling into a rut. So thoughout the long vac. the committee (average of 12) during 14 meetings, booze shows and other social gatherings, formulated plans which resulted in an Australian high of 420 members, a spectacular rise from relative obscurity to the biggest non-faculty society in the Uni, and a touch of Prosh all year round.

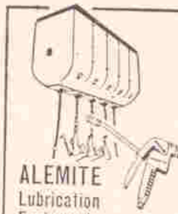
APAC



. . . in their dual purpose of magnifying man's strength and capacity and expediting his efforts with maximum efficiency . . . are building products that touch the lives of the whole community. In homes, stores, factories, warehouses, garages, transport terminals, in fact business premises of all kinds, it's there you'll find these quality Apac products.

APAC
Automotive
Jacks

Provides the right jack for every type of Automotive service. Whether it be the smallest passenger car jack or the giant 20,000 lbs. garage jack, all are 100% Australian —backed by a nation-wide service organisation—as a range they constitute the largest in the Southern Hemisphere.



ALEMITE
Lubrication
Equipment

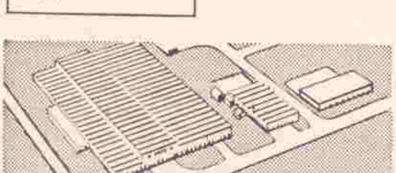
Famous the wide world over as the originator of modern lubrication, the comprehensive range of Alemite Automotive, Industrial and Agricultural lubrication equipment—manufactured under licence from the U.S.A.—now serves Australia's needs in the constant war against friction.

LEMCOL
Materials
Handling
Equipment

"The name that carries weight" signifies Australia's largest range of Hand and Platform Trucks. Lift Jack and Elevating Truck Systems, Booster Conveyors, Two Ton Trailers and Wheels and Casters. Wherever there are goods to be moved it's there you'll find Lemcol products in constant demand.

YALE
Fork Lift
Trucks

The world's most complete range of Industrial Fork Lift Trucks are now made in Australia by Apac Industries Limited, under licence from Yale and Towne International Inc. The Yale range includes the gasoline and L.P. Gas Fork Trucks, featuring an exclusive fluid coupling drive in capacities of 3,000 to 8,000 lbs. Battery electric Yale Fork Trucks using the latest Cam-o-tactor travel control mechanism and other special features are also included in this range.



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CLYDE

A MEMBER OF THE CLYDE INDUSTRIES GROUP

Orientation Week saw the opening of the Information Booth. This was the first time anything like this had been seen at Adelaide Uni, and its success can be estimated by the 350 members who joined up there during the four days it was open. The way in which we publicised the Society's policy, aims and past achievements, intrigued many another society and it is likely we will see a few copyists next year. That an information centre like this is an ideal set-up for any society wishing to attract members to its cause seems obvious now, but it took SCIIAES to inaugurate it.

Another SCIIAES first was the "Bird-dropping" a few days later. This was an attempt to fly to the weir and back in a figure-of-eight course by manpower alone. When Superman, the hot favourite, was foully done by some nasty person who Krypton-lined his cape, the honours went to SCIIAES president who flew 5ft. $3\frac{3}{4}$ins. inhis "Camel" kite. He was afterwards heard to remark that " after a week of Camels, I think I'll switch back to women". From now on, this will be an annual Orientation Week event with other societies and faculties competing.

Wednesday came and went, leaving the title of Miss Fresher securely upon the head of the SCIIAES entrant Julie Martin. Since Miss Fresher was to crown the winners of the Mini-bike Marathon the next day we thought our fortunes were well and truly made. However, when the SCIIAES appeared, resplendent in full racing leathers, the crowd immediately set them apart from the rest of the motley lot and began to good naturely strangle, murder, pale-axe, suffocate in buckets of sand, drown in buckets of water, and otherwise attempt to slow them down. Still, SCIIAES managed a minor place. Incidently SCIIAES has donated a perpetual trophy for the most consistent third in the side-car division at Rowley Park. Since this division has only four competitors in each race, the SCIIAES trophy is keenly contested for. This year it was won by Charlie O'Connell, who made a magnificient come-back to snatch the trophy in the final race for the season.

With SCIIAES bursting on the scene out of nowhere, the S.R.C. was startled and suspicious. Suspicious because SCIIAES had had a reputation of being a rabble-rousing minority. However, with the help of Anne Dunn and Phys Roberts, mutual distrust gave way to peaceful coexistence. One of the early results of this was the SRC-SCIIAES Discotheque, Adelaide's first discotheque. The SRC also received SCIIAES co-operation during the Eat-In and Work-Out (we were one of the two societies that participated actively in the Work-Out). Members really appreciated the "free pint per block" scheme that operated from both hotel headquarters.

Although SCIIAES is no longer an Engineering society, Engineers still figured prominently this year. It was an Engineering team which won the 1st Annual Bathtub Championships, and collected a dozen beer, the perpetual trophy and a cake of Puralin TCC. The captain of the team also received huge smacking kisses from Roger Cardwell and Gail Spiro. SCIIAES also fought the "war" in the Med-Engineer's tug-of-war, and took part in the AUES "Car-Rumble". SCIIAES won the "Car-Rumble" and assisted A.U.E.S. in creating the new Australian Record of 27.3 secs (previous 31.6 secs.) for "Volkstoting". Unfortunately this same victorious VW on loan from Sierop Bros, never made it past a certain intersection in Melbourne Street where it rolled over and fell asleep forever.

"Brian's Barn" intended as a small show for about 100 members, turned into a gigantic grog-on for 400 people who knocked off 200 gallons into $3\frac{1}{2}$ hrs. Not had for 15/- a double.

The Purity Cabaret was cancelled, much to the intense annoyance of the Vice Squad, but the Cheese-tasting was not. If you missed the Cheese Tasting you can tear this magazine up in disgust, for not only was there all you could eat and drink but there was almost twice as many birds as guys. One person took full advantage of the situation and left the scene with 5 birds.

The SCIIAES Car Trial - again, a roaring success with all you could drink for 5/-. Incidentally this was about the third show straight we made a loss on this year. This is a result of the committee's decision to forget about making money, and concentrating on giving the members as many benefits as we can.

As this article is being written, SCIIAES is busy organising the "Carnal Carnival", the football match, cum battle of the sexes cum Merv the Purv's delight, to be held at the Clarendon Oval July 24th.

Prosh. What can you say about Prosh? Nothing, except that thanks to SCIIAES, this will be the biggest Prosh ever. Two big stunts which by themselves would rate Australia-wide headlines are planned for execution in Prosh Week. For obvious reasons we cannot say much at this stage.

The traditional SCIIAES breakfast is to be held in and around the Torrens, hence the title "Breakfast in Bed". We will also provide double-beds for another attempt on the bed-cramming record - already held by SCIIAES with 88 people.

This year has been a year of unthought of success for this Society. The experience gained by the committee members in particular should enable each one to start a very successful con-man racket. Next year we hope to have 600-700 members, and since Flinders University has only 400 students, it has been suggested we open SCIIAES UNIVERSITY in the refectories.

We feel sure that if our late, dearly-beloved founder Xavier Xerxes Throgmorton were alive today, we'd hit him for the 9 years unpaid membership fees he owes us.

Mike Roach
Publicity Officer
On behalf of the SCIIAES
Committee.

BLIND DATES

A THESIS BY MICHAEL HUNT

At some stage during his university career, every male student is bound to come across a creature called "a blind date". Blind dates come in an assortment of sizes and shapes .. all ridiculous. Blind dates are found everywhere. Their names appear on discarded lecture notes, the walls of the men's change room and in the Suggestions Box outside the Guild Council Room. Blind dates are arranged and discussed by everyone .. relatives over sherry before dinner, girls over coffee in the Ref., boys over beer at Steve's.

Blind dates have a difficult career: popular girls rubbish them, popular boys ignore them, parents console them, Dorothy Dix advises them, Silhouette cons them, lecturers pass them and nature fails them. A blind date is never Miss Uni., a ballet dancer, a model, a millionaire's daughter, an art student, or a blonde folksinger. She is always a nurse, a friend's sister, a member of the judo club, a cousin from Widgiemooltha, an honours geology student, a bank typiste or the goalie in the women's hockey team.

She is the girl across the street who looks like the boy next door. A blind date is a mixture: she has the gender of Brigitte Bardot, the figure of Santa Claus, the hairdo of Dagwood, the voice of Chips Rafferty, the nose of Bob Hope, the facial expression of Lassie, the posture of the Road Runner, the eyes of Herman Munster, the lips of a lubra, and the aroma of the University Football Club's change room during half-time. A blind date likes handsome boys, going out for dinner, romantic strolls through the Sunken Garden, attention and respect, but somehow she never gets any of them.

A blind date doesn't like insults, laughing out loud when you meet her, introducing her to your friends as an April Fool's joke, spending Graduation Night at the Burger King, nominating her for the Mr. Hairy Legs Competition, or taking her up to King's Park .. and then leaving her there alone. When you take out a blind date you can't win. Who else ruins your evening just by showing up? Who else gets the giggles during the National Anthem? Who else has lipstick on her teeth? Who else wears a spencer under a ball gown or long woollen underwear with stretch slacks? Who else wears so much make-up to a ball that it gets all over your clean dinner-suit? Who else has long blonde hair with black roots? Who else has a measurement of 36-24-36 .. on her leg?

But you know very well that at the end of the evening, when you take her home, and she turns softly to you, shakes your hand, trips over the door-mat, and shuts the door on your hand .. you will shout after the words that millions who have taken out blind dates have shouted before .. "How about the Drive-In next Saturday night?"